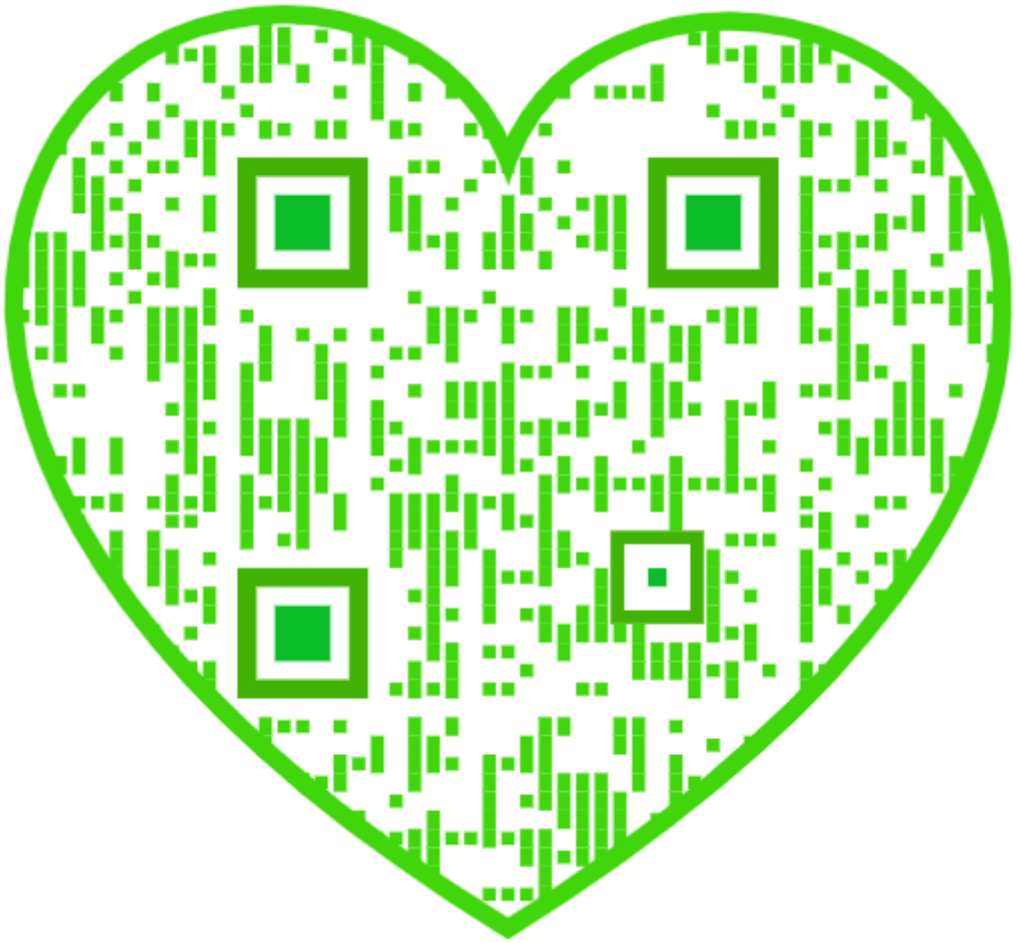

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OBSTETRICS

NORMAL AND OPERATIVE

BY

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419 ILLUSTRATIONS

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PREFACE

In the following pages I have endeavored to set down some of the results of a fairly extensive experience in the hospital, private, and consulting practice of obstetrics, and in the teaching of students, first of undergraduates at the Cornell University Medical College, and later of postgraduates at the New York Polyclinic. 91

In spite of the fact that there are many excellent text-books in the field, I have ventured to think that there is room for another, based upon a different plan. Most obstetrics works, it seems to me, contain too much irrelevant matter and too little about the practice of obstetrics. This is because they are constructed upon a plan which, while it has the authority of tradition and custom, does not conserve the interests of either practitioner or student. It is discouraging to both, for example, to find so large a space devoted to developmental anomalies and fetal monstrosities that little or none is left for the superlatively important subject of fetal mortality in labor. It is to the last degree exasperating to find a long biography of the Chamberlen family, and to search in vain for information as to the method of employment of that marvel of mechanism, the axis-traction forceps.

Let us take another example. If in the course of a difficult version the operator finds it impossible to grasp a knee or foot, the difficulty may sometimes be obviated by the simple expedient of turning the patient upon her side. This is one of the most important facts in the whole range of clinical obstetrics, and yet, turning to some standard text-book, we find that it is either unknown or unnoticed, but observe at the same time that considerable space is devoted to the subject of the cause of menstruation.

I have omitted the traditional section on embryology, which has become a science in itself and can be adequately treated only in a separate work. Of course, I would not minimize its importance. A knowledge of physiology is absolutely necessary to the intelligent practice of medicine, but no one would now think of taking up a large part of a work upon the practice of medicine with a preliminary treatise on physiology. The section on anatomy has been omitted for a similar reason.

The theory of pure obstetrics, however, without a knowledge of which

the practice of obstetrics can never reach the dignity it deserves, has not been neglected. I have tried to give briefly and plainly the essentials, *i.e.*, about as much as the student ought to know, or is likely to remember. Enough also to serve, if desired, as a groundwork for further study.

This book contains many original photographs made especially for me at the New York City Hospital and elsewhere. These photographs seem to me to be unequalled, but perhaps I am a partial witness. For the privilege of reproducing, sometimes with slight modifications, certain illustrations, particularly Professor Fabre's collection of photographs showing the various forms of pelvic contraction, I am indebted to the publishing house of J. B. Baillière et Fils, of Paris. Other illustrations have been borrowed, but always with due credit. I conceive it to be the duty of the author of a scientific work to give his readers the best illustrations he can get without reference to their source, provided, of course, due credit is always given. The purpose of such a work is not so much to extend the author's fame as a draughtsman, as to teach the reader what he wishes to know. Some original illustrations have no other merit than originality.

I have not attempted to write a dictionary of bibliographical reference, and I have tried to omit those things which are of historic or academic interest only, and those things which every one knows, in order to have space for those essentials of the practice of obstetrics which many do not seem to know.

Every text-book is to some extent a compilation, and it is well to acknowledge this at the outset. I trust, however, that this book will not be found wanting in the expression of individual opinion, and that where I have quoted much I have not failed to give due credit.

In conclusion I would extend greeting and congratulation to all those who, whether as practitioners or as specialists, are engaged in the arduous and trying work of obstetric practice. In no department of medicine are more positive results obtained. In none is there greater alleviation of suffering or saving of human life. This beneficent work is its own reward.

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OBSTETRICS
NORMAL AND OPERATIVE

PART I
PREGNANCY, LABOR AND THE PUERPERIUM

CHAPTER I

CHANGES IN THE MATERNAL ORGANISM RESULTING FROM PREGNANCY

1. Local Changes. 2. General Changes

By pregnancy or gestation is meant the period extending from conception to the beginning of labor. Since we can never know the exact date of conception, even though the date of fruitful intercourse be known, the exact duration of pregnancy in a given case cannot be computed, but the definition here given is the only one possible in the present state of our knowledge, and is, for all practical purposes, sufficient.

Under ordinary circumstances the ovum and spermatozoon meet in the Fallopian tube and it is there that the fertilization of the ovum occurs. With the meeting of these two elements begins the drama of pregnancy and labor, than which there is no more interesting subject in the whole range of natural science.

It begins indeed, with a striking and wonderful phenomenon which in the present state of our knowledge is beyond the limits of explanation or interpretation. The mere presence of the fertilized ovum, which, so far as we can see, is a mere guest, a separate organism, receiving nutriment and oxygen from the maternal blood, but without other demonstrable connection with the mother, inaugurates in the maternal organism a series of changes far-reaching and profound, which we endeavor to group and describe under the term pregnancy.

A description of pregnancy, then, means a description of the changes in the maternal organism that follow conception.

What are these changes? They may be divided into two classes: local and general. Let us begin with those that are most characteristic, and most important from a clinical and diagnostic point of view—the local changes, and first of all the change in the uterus.

Changes in the Uterus—This organ, which, at the beginning of pregnancy is about three inches in length with a transverse diameter of

about two inches and an anteroposterior diameter of about an inch and which at that time weighs about 50 grammes and lies entirely within the pelvic cavity, must become large enough to contain the mature fœtus, the new-born child, its fundus rising to the ensiform cartilage, its bulk increasing until it not only fills but greatly distends the abdominal cavity, and its weight reaching 1000 grammes. We need not marvel that an ancient writer, contemplating this transformation, cried out, "Ein Wunder der Natur ist der menschliche Uterus!"

FIG. 1.—Non-pregnant uterus.

How is this change brought about? Physiology does not answer the question. The increase in size does not result from distention from within, as popularly supposed, and as taught by the older writers. That this is true is shown by the fact that the uterus enlarges in extra-uterine pregnancy, as well as in pregnancy that is normal. The enlargement is due to a hypertrophy of all the uterine structures, the so-called eccentric hypertrophy. It is greatest in the first four months in which the uterus increases threefold in thickness, *i.e.*, it attains a thickness of about two and a half centimetres (2.5 cm.). During the latter half of pregnancy it increases enormously in area but becomes much thinner—thinner even than it was

before pregnancy began. In some cases, especially in women who have borne many children, the fetal parts are felt with startling distinctness, as though through a covering of paper. There is some dispute as to whether the uterus is distended by the fœtus during the latter months of pregnancy. It is not probable that this is the case except under abnormal conditions, *e.g.*, hydramnion or multiple pregnancy.. According to Krause, the capacity of the uterus is increased 519 times during pregnancy.

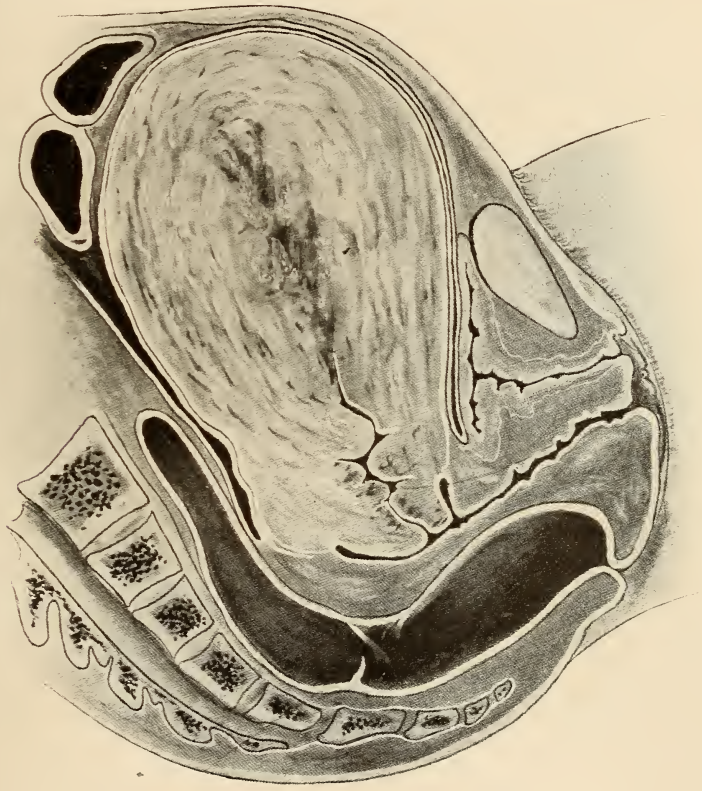


FIG. 2.—Uterus at time of delivery.

The hypertrophy of the pregnant uterus embraces all the component parts; muscles, vascular system, connective and glandular tissue, and mucous membrane; also the lymphatics and nerves.

The uterine bulk is composed chiefly of muscular tissue. Let us consider first the changes in the muscle. They consist chiefly in hypertrophy of individual muscular cells already present in the virgin uterus. New cells play but a comparatively unimportant part in the process. It is interesting to note that the individual cells are not destroyed during

involution, but remain; perhaps to form the nuclei of subsequent development in a later pregnancy. The fibres of the pregnant uterus are estimated to be ten times as long as in the unimpregnated condition, and proportionately increased in width. Thus does nature provide for the strenuous work which the uterus will have to perform at the time of labor.

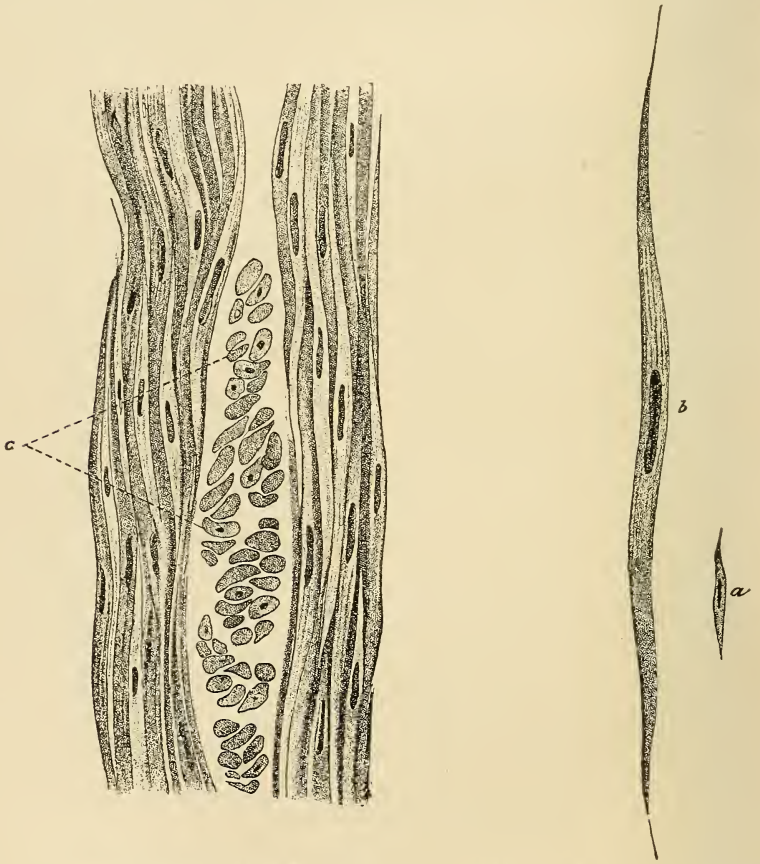


FIG. 3.—Non-striated muscle of the uterus. *a*, fibre of non-pregnant uterus; *b*, fibre of the pregnant uterus; *c*, cross-section of fibres of the pregnant uterus.

The muscular fibres of the cervix undergo moderate hypertrophy but to a less extent than those of the body of the uterus. There is, however, a relatively greater development of the elastic tissue. Thus does nature afford provision for the dilatation that is indispensable to the progress of labor.

The hypertrophy of the uterus is greatest at the fundus. This is vividly appreciated by every one who has had occasion to make the uterine incision in the Cæsarean section. It is well shown in the accompanying

illustrations. Note that the tubes and round ligaments which are ordinarily given off from the uterine cornea are, in advanced pregnancy, given off at some distance below showing the relatively great increase in growth at the fundus. The round ligaments, too, which are an integral part of the uterine muscle and which serve to limit the ascent of the uterus during labor, are much hypertrophied, so much indeed that in certain cases of delayed labor they may be plainly felt and even seen through the abdominal wall, as large tense cords running obliquely downward at the sides of the uterus (Figs. 4 and 5).

FIG. 4 FIG. 5

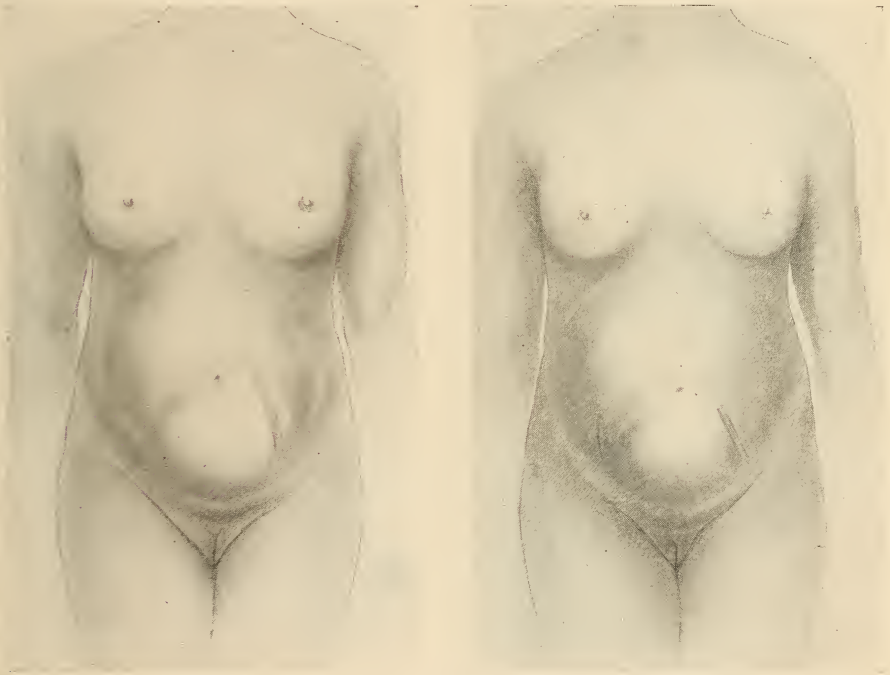


FIG. 4.—Case of brow presentation with threatened rupture of uterus. Round ligaments clearly felt and seen through abdominal wall.
FIG. 5.—Overstretching due to oblique position. Both round ligaments perceptible.

Ahlfeld has called our attention to the fact that when the placenta is posterior the tubes converge anteriorly, and vice versa. It has been shown, however, that this rule is not of universal application.

THE MUSCULATURE OF THE PREGNANT UTERUS.—The arrangement of the muscular layers and fibres of the uterus during pregnancy is very complex and has been the subject of unending study and discussion. Bayer, in Germany, and Hélie, in France, have been untiring workers in this field, and it is to them that we owe most of our knowledge of the subject, which, however, is yet far from exact.

To summarize briefly, we may, in a general way, divide the muscular tissue of the uterus into three layers.

1. An external layer, very thin and closely united with the peritoneum.

2. A middle layer which comprises the bulk of the uterus, and which consists of longitudinal and circular fibres intimately blended in an arrangement complex and difficult to follow. The circular fibres, however,

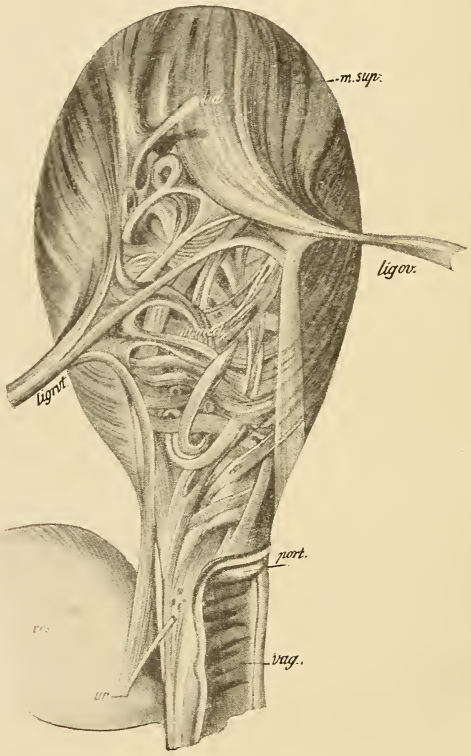


FIG. 6.—The musculature of the pregnant uterus, dissected and seen from the side. (Luschka.) *ves.*, bladder; *ur.*, ureter; *vag.*, vagina; *port.*, vaginal portion; *lig. rot.*, round ligament; *lig. ov.*, ovarian ligament; *tub.*, Fallopian tube; *m. sup.*, superficial muscular layer; *m. med.*, middle muscular layer.

surround the blood-vessels, nature's provision for the prevention of hemorrhage.

3. An internal layer of circular fibres concentrically arranged about the internal os and the uterine ends of the tubes (Figs. 6, 7, and 8).

The retractile function of the uterus is a property not found in other muscular organs and its mechanism is not clear. Hence it is not strange that the muscular arrangement seems complex even to skilled pathologists and laboratory workers.

Other Changes.—For the nutrition and development of this mass of

newly-formed muscle, there must be a corresponding increase in the vascular supply, and thus we find arteries and veins, especially the latter, greatly hypertrophied. This greatly increases the volume of venous blood and accounts for the frequency of varicose veins, phlebitis and emboli in pregnancy (Fig. 9).

With all this, there is inevitably an increased activity of the lymphatic system and an enlargement of the lymphatic glands. It is this relatively enormous increase in the venous and lymphatic supply that accounts for

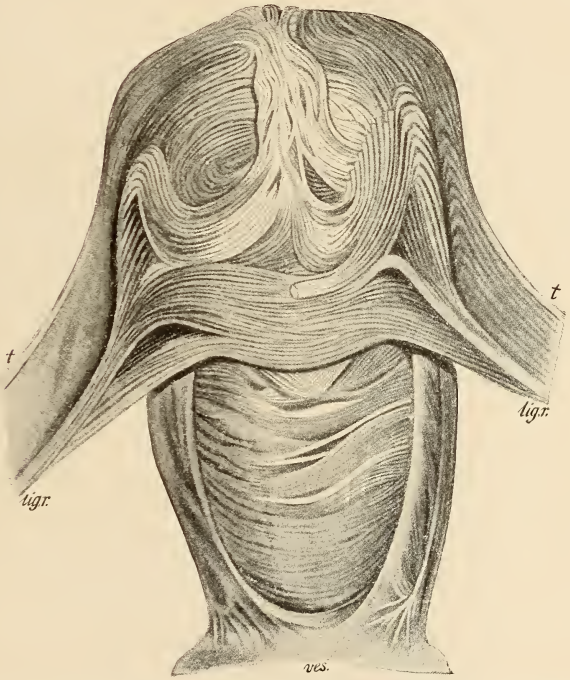


FIG. 7.—The musculature of the pregnant uterus, front view. (Hélie.) The peritoneum has been dissected off and the bladder separated from the uterus and turned down. *tt*, the Fallopian tubes; *lig. r.*, the round ligaments; *ves.*, the bladder.

the added susceptibility of the lying-in woman to the transmission of infection, and for the rapidity with which it sometimes spreads.

The nervous supply is also more highly developed, the great cervical ganglion becoming more than twice its usual size. This serves to account for the increasing irritability of the uterus as the patient approaches term, and undoubtedly helps to determine the final onset of labor.

The connective tissue of the uterus and especially, as already noted, that of the cervix, is also hypertrophied and is much softened by the serous infiltration that goes with the increased vascular and lymphatic supply. Thus does nature provide not only for the softening and dilatation of the

cervix and lower uterine segment that are so necessary during the latter weeks of pregnancy and the early part of labor, but also for the various and comparatively rapid changes in the size and shape of the uterus that constitute so prominent a part of the parturient process.

The whole uterus, then, is softer than in the non-pregnant condition; but this softening is much more marked in the cervix and lower uterine segment. As we shall see in the next chapter, these facts help us in making the diagnosis of pregnancy. It is the softening of the lower

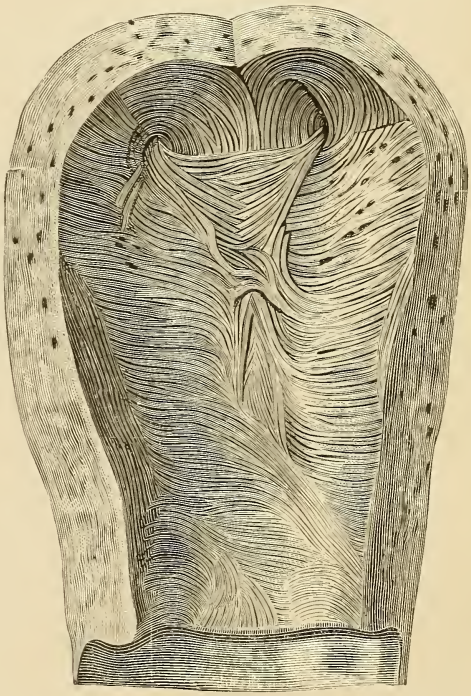


Fig. 8.—The submucous muscular layer of the pregnant uterus. (Hélie.)

uterine segment that enables us to elicit Hegar's sign, the most characteristic of all the signs of early pregnancy.

But the muscular tissue, the blood-vessels and the lymphatics are not the only tissues concerned. As the student has seen in his embryological studies the mucous membrane of the uterus becomes hypertrophied to provide means of shelter and nutrition for the fertilized ovum, and thus are formed the decidua vera and the decidua reflexa. The hypertrophied mucous membrane fills the cervical canal with a tough plug of mucus. Sometimes the excretory ducts of the cervical glands become obstructed, giving rise to hard nodules, the so-called Ovula-Nabothi.

The Growth of the Uterus.—Toward the end of the third month the fundus can be felt on a level with the symphysis and during the remainder of pregnancy it rises by regular gradations until about three weeks before delivery, when it fills the abdominal cavity and reaches, or nearly reaches, the ensiform cartilage, only to sink to a lower level as labor approaches.

The clinical evidences of this growth will be considered in the next chapter in connection with the diagnosis and clinical phenomena of pregnancy.

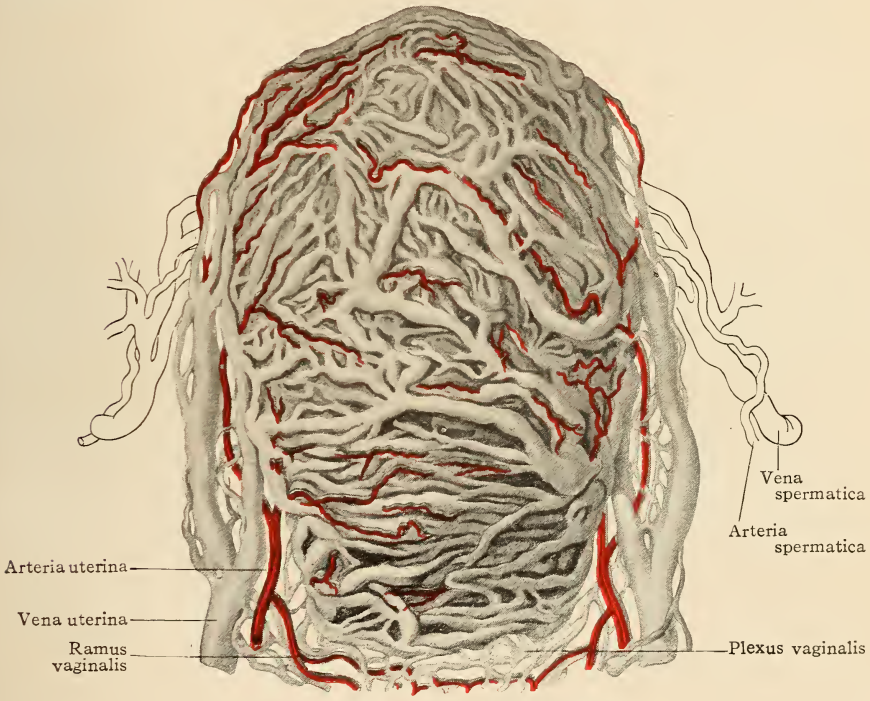


Fig. 9.—Vascular system of the uterus.

Changes in Shape and Position.—But it is not only in size that the uterus changes; there are certain changes in shape and position that must not be forgotten.

The first noticeable change is that the lower uterine segment fills out, making the body of the uterus spherical rather than pear-shaped and causing an apparent shortening of the cervix. This is one of the most important of the early signs of pregnancy, as we shall see in the next chapter.

Later, however, as the fundus rises in the abdominal cavity, the uterus assumes an oval form. Thus we have the uterus first pear-shaped as in

the virgin state, then spherical, and finally oval (Figs. 10, 11 and 12).

The uterine ovoid, however, does not remain symmetrical throughout pregnancy. In the first half of pregnancy it is larger and thicker upon the side which contains the ovum, another sign of pregnancy; not a very positive one, it is true, but of some value to the experienced examiner. It is not until the second half of pregnancy that the other side of the uterus is filled out by the enlarging ovum (Fig. 13).

The normal position of the pregnant uterus is one of anteversion, and as the body of the uterus increases in size and weight it develops a tendency to sink forward and thus make more acute the angle between body and cervix. This tendency is favored by the softening of the lower uterine segment already noted.

FIG. 10.—Pear-shaped uterus.

FIG. 11.—Spherical uterus.

This symptom disappears of course as the uterus rises into the abdominal cavity but promptly reappears after delivery and persists normally during the lying-in period. When exaggerated it may cause retention of lochia with alarming symptoms, as we shall see when we come to study the pathology of the puerperium.

Uterine Inclination.—The uterine inclination or the direction of the long axis of the uterus varies with the condition of the abdominal walls. In primiparæ with firm and resistant walls the uterus may rest upon the spinal column, its axis being directed even farther backward than that of the superior strait. In these cases the centre of gravity is so far back that the patient, in order to maintain her equilibrium, throws the head and shoulders backward instinctively, adopting a sort of military attitude familiar even to the laity. In multiparæ with lax and atrophied abdominal walls the uterus falls forward. Sometimes, especially in cases of con-

tracted pelvis, when the presenting part cannot enter the brim, or when the intra-abdominal space is restricted, this tendency to fall forward is much exaggerated, the fundus actually reaching a lower level than the symphysis—pendulous abdomen, *Hängebauch* of the German clinics. In primiparæ the uterus points directly forward, *Spitzbauch*.

These conditions are described and illustrated in connection with the subject of pelvic contraction.

Right Lateral Obliquity of the Uterus.—In advanced pregnancy the fundus uteri is usually found, not in the median line as one would at first thought suppose, but on the right side in the region of the liver, though

FIG. 12.—Ovoid uterus.

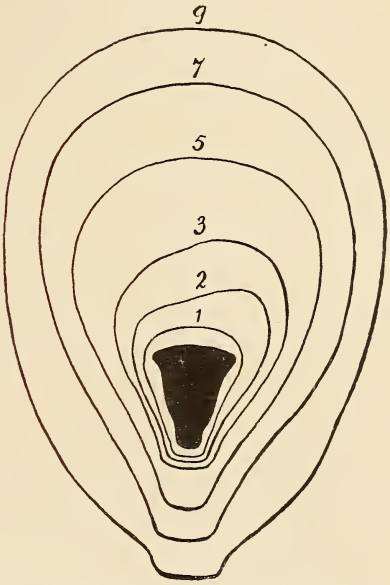


FIG. 13.—Uterus at successive months. (*After DeLee.*)

it may be found in the median line or even on the left side. This fact soon becomes familiar to every physician.

Uterine Torsion.—Not only does the uterus as a whole incline somewhat to the right but it is also twisted to the right. In other words, it is rotated on its long axis so that its anterior surface does not look directly forward but somewhat to the right.

What is the cause of uterine obliquity and torsion? Both are usually attributed to the position of the rectum and sigmoid flexure on the left side of the pelvis and the consequent shortening of the right oblique diameter. An additional factor in the case of right uterine obliquity is, perhaps, the fact that most patients sleep upon the right side.

Importance of These Facts.—Both facts are of clinical importance.

For example if, in the performance of the Cæsarean section, the operator makes his incision exactly in the median line and does not, before making it, instruct his assistant to rotate the uterus to the left, he will find his uterine incision not where he intended to make it, in the median line, but well to the left side which, as we shall see when we come to take up that subject, is highly undesirable.

Again the left ovary and tube are much nearer the median line and much more accessible to palpation than are the right.

And finally, in estimating the period of pregnancy that has been reached in a given case with a view perhaps to determining the maturity of the fœtus and the wisdom of the induction of labor, the fundus should be carried to the median line in order that a clear conception of its true height may be obtained, its distance from the symphysis measured, and the length of the fœtus approximately determined.

Relations of the Pregnant Uterus.—With the increase of size and the change of position which the uterus undergoes during pregnancy its relation to surrounding structures is of course radically changed. In front is the bladder which during pregnancy becomes at least in part an abdominal rather than a pelvic organ. By virtue of its attachment to the anterior uterine wall it is carried far upward and somewhat to the right. The latter fact is due to the familiar right obliquity of the uterus. This changed relation of bladder and uterus finds an important practical application in the performance of the Cæsarean section. If the incision is too low or if the bladder is not emptied before the operation the result may be easily imagined.

The ascending, transverse, and descending colon encircle the uterus like a hood or frame. The small intestines, too, are found at the fundus and at the sides of the uterus; seldom in front. Now and then, however, a stray loop may be found anteriorly, another fact of practical importance in connection with laparotomy during pregnancy.

In front the uterus is in direct relation with the abdominal wall and behind it rests upon the spinal column, these positions varying of course with the position of the patient, whether standing or recumbent.

Changes in the Adnexa.—With the growth of the uterus the folds of the broad ligaments become separated and owing to the widening of the uterus the tubes hang close to its sides instead of branching out as in the non-pregnant condition.

Changes in the Cervix.—During the latter months of pregnancy there is apparently considerable shortening of the cervix. Whether this shortening is real or only apparent has been for many years a matter of controversy —the *Cervixfrage* of the German writers.

We shall see in studying the physiology of labor how during that process the body of the uterus becomes divided into two parts, one thin and dilatable, the lower uterine segment, the other thick and con-

tractile, these two parts being separated by a muscular ridge known as the contraction ring.

Writers upon this subject are divided into two camps. On the one side are those who maintain that the shortening of the cervix is real and that with the advance of pregnancy the cervix is taken up to form the lower uterine segment. On the other side are those who maintain that the cervix has nothing to do with the formation of the lower uterine segment

FIG. 14.—Relation of the colon to the pregnant uterus.

and that cervical shortening during pregnancy is only apparent, being the result of fusiform dilatation or of obliteration of the anterior lip by the pressure of the fetal head.

The reader will notice at once that in these cases the shortening is apparent rather than real and that, if the head is pushed up, the canal will be as long as before. On the other hand there is no doubt that in cases of extreme distention from any cause, *e.g.*, hydramnion or twin pregnancy, the canal is much shortened and sometimes practically obliterated. This I have many times had occasion to verify.

The majority of writers at present appear to favor the theory of the non-shortening of the cervix, but the question so aptly asked by Ohlshausen, "Why should so homogeneous a structure as the corpus uteri be divided during pregnancy into two parts so radically different

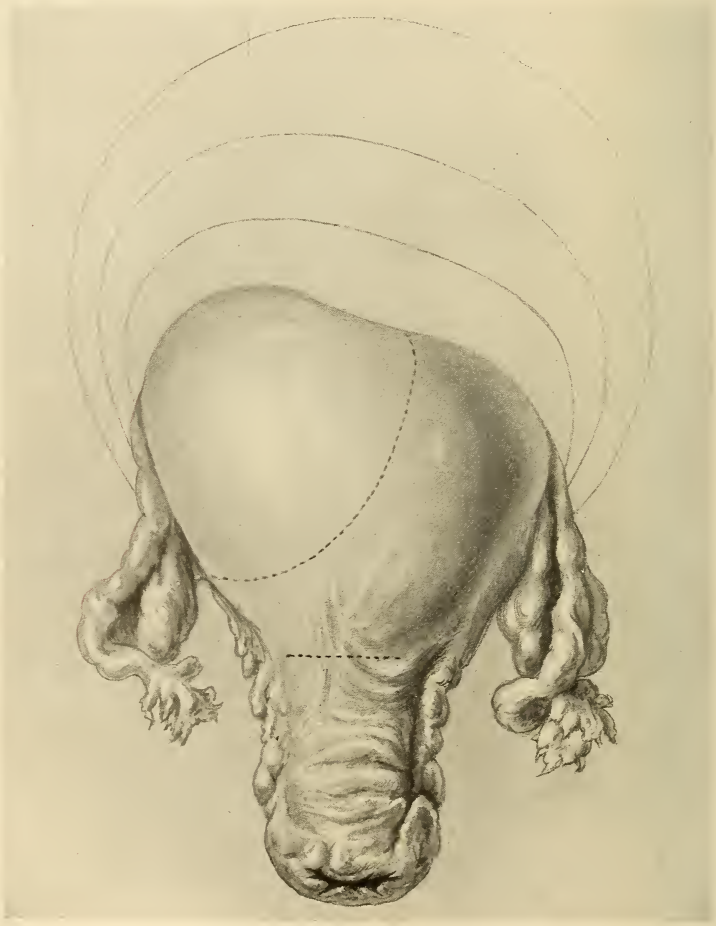


FIG. 15.—Pregnant uterus at the third month, posterior aspect.

in function as the upper and lower uterine segments?" remains unanswered.

THE CERVIX AT OR NEAR TERM.—Whatever views we may hold as to this matter we must not forget to study carefully the important practical topic of the comparative shape, size, and degree of dilatation of the cervix and its canal during the latter weeks of pregnancy.

In primiparæ the canal is cylindrical or perhaps spindle-shaped. The

external os is firm in consistence and punctiform in shape. It is usually closed, or perhaps barely admits the tip of the finger though not very infrequently the finger may be passed through both the external and the internal os without difficulty.

In multiparæ the conditions are quite different. The external os is represented not by a point but by a transverse slit with a notch at either end—the usual slight but plainly appreciable bilateral tear almost always found in primiparæ. Exceptions to this rule are rare but they do occur.

FIG. 16.—Ovoid uterus of advanced pregnancy. Adnexa converging anteriorly.

Now and then we find a case in which the tear is not present and in which the cervix cannot be distinguished from that of a primipara.

The internal os is smaller and more tense than the external os. It is circular but it is not closed. Indeed it almost always admits one or two fingers without difficulty, and its firm and resisting ring presents a marked contrast to the relaxed and yielding margins of the external os. The canal taken as a whole resembles an inverted funnel, the internal os being much smaller than the external whose resistance has been partly destroyed by previous labors.

The reader should be careful to familiarize himself not only by study

but by actual practice with the condition of the cervix in primiparæ and multiparæ during the latter weeks of pregnancy. It is a subject of great practical importance and one to which we shall frequently have occasion to refer.

Changes in the Vagina.—The mucous membrane of the vagina too becomes congested and infiltrated and the purple color thus caused is one of the corroborative signs of pregnancy. Its secretion is increased, another corroborative sign. This secretion, profuse, acid and thickened with epithelial débris, soon becomes familiar to the obstetrician. According to Döderlein this acid secretion inhibits bacterial development. The surface

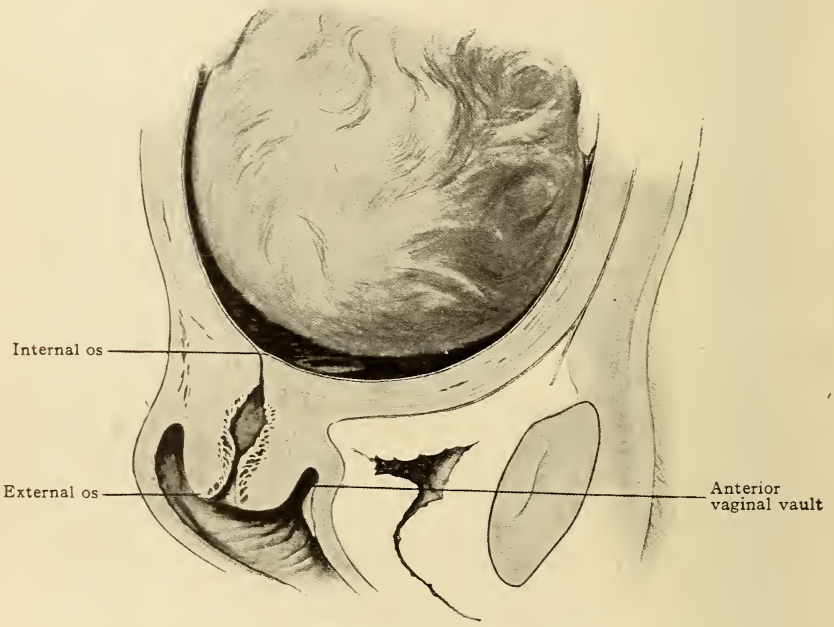


FIG. 17.—Seventh month. Head high, anterior vaginal vault preserved.

of the mucous membrane is roughened and the rugæ become more marked. The purple pouting mucous membrane projects from the vagina, simulating rectocele and cystocele, presenting a picture of advanced pregnancy very familiar to the observing physician.

The **vulva, perineum** and **pelvic floor** become softened and infiltrated and there is a general downward sagging of the pelvic floor—the "pelvic floor projection" of Hart and Barbour.

Changes in the Pelvic Joints.—Even the pelvic joints, the pubic symphysis and the sacro-iliac articulations, become infiltrated, softened and more movable than in the non-pregnant state. Doubtless these changes

have helped to turn the scale in favor of the patient in many a doubtful case. DeLee has shown by careful measurements that toward the end of pregnancy there is an actual enlargement of the pelvis.

Changes in the Abdominal Walls.—In the latter part of pregnancy and especially in cases attended by much distention or in women who have borne many children the abdominal walls become thin, atrophied and bloodless. This too is especially noticeable to one doing his first Cæsarean section. Oftentimes it is not necessary to tie a vessel in these cases. One notices, too, how distensible the wall is and how one can stretch a three- or four-inch incision with a finger hooked in each end until it is quite large enough to permit the extraction of a child. It seems almost as

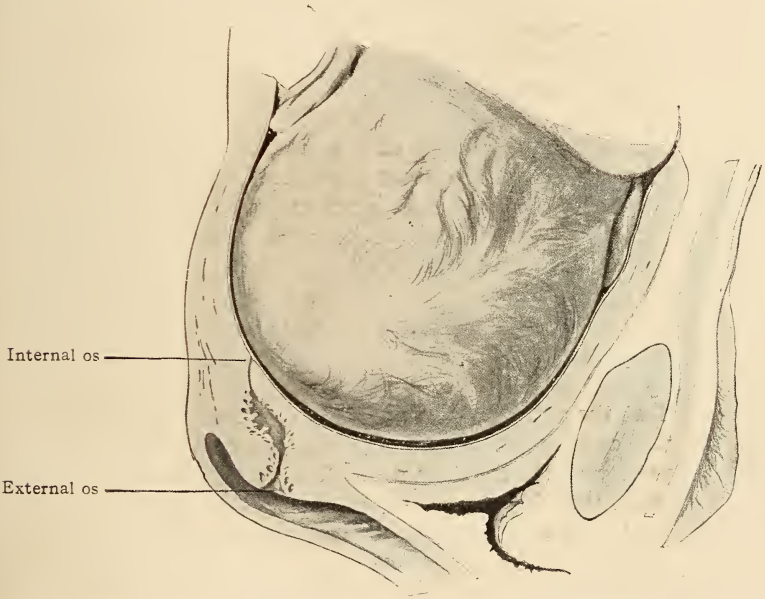


FIG. 18.—Shows obliteration of anterior lip of cervix, head having entered the pelvis. Anterior vaginal wall pressed down.

though kind nature had made provision for the necessities of the operation.

With the ascent of the uterus the navel gradually ceases to be a depression and with the beginning of the seventh month or a little later it begins to protrude.

Such in brief are the outlines of the changes in the generative organs that follow conception. They can be found in greater detail in works devoted to embryology and to the theory rather than the practice of obstetrics. To attempt to master all the minutiæ of the subject would be a tedious and, for the non-specializing student, perhaps a profitless task.

All should know the main facts, however, and when these facts are studied and taught with appreciation and intelligence, as affording the best,

indeed the only rational, basis for much of obstetric diagnosis and treatment, the work becomes a delight in itself.

But the effects of pregnancy are not felt by the pelvic organs alone. Every tissue, organ, or function of the body is or may be affected. It is therefore necessary for us to consider the influence of pregnancy upon the organism in general.

General Changes in the Maternal Organism.—Pregnancy is not a disease. Indeed it might not be amiss to call it the highest kind of health; the highest development of the normal physiological capacity of womanhood. Many writers say that pregnancy is a test of the organism, and this is true; if the organism is sound it responds to the test and, despite much inconvenience and some temporary sacrifice and suffering, the patient emerges from her period of trial not only uninjured but benefited. It is a matter of common observation that women who have had several or perhaps many children are usually in better health than their less fortunate sisters. It is the subsequent care of the children under the strenuous and unnatural conditions of our modern life that sometimes makes motherhood seem almost too great a burden.

But we must admit that the organism is not always equal to the strain; that it not infrequently breaks down at its weakest point. This may happen during the early months of pregnancy, before it has become adjusted to its new burden, or perhaps later on as the demands upon the organs of elimination increase. Untoward accidents may occur or some intercurrent or complicating disease may suffice to turn the scale in the wrong direction.

Thus we see that the pathology of pregnancy affords a wide field for study. But this will come later. Let us consider here only those changes that mark a pregnancy approximately normal, beginning at the fountain head, *i.e.*, with the heart and general circulation.

Changes in the Heart and Circulatory Apparatus.—For a long time it was generally believed and taught that pregnancy is normally accompanied by a certain amount of cardiac hypertrophy and some still hold this opinion. It is probably incorrect. Doubtless it originated in the fact that the apex beat is often displaced by the ascending uterus. The assertion that the heart has more work to do during pregnancy and therefore must hypertrophy is to be met by the reply that nature has methods of adjustment and compensation that we do not understand. Moreover, careful measurements have failed to establish any hypertrophy. (Bumm.)

To my mind it is sufficiently clear that there is no considerable hypertrophy of the heart in pregnancy. It is certain that the normal heart of a healthy woman is not usually damaged by pregnancy, and many women with organic heart trouble sustain the ordeal of pregnancy and labor without bad results.

It is important, however, for the reader to remember that an entirely innocent heart murmur often co-exists with pregnancy. This fact, often

overlooked in the text-books, soon becomes familiar to the house surgeons of maternity hospitals and should be known to all physicians, that needless alarm may be prevented. A systolic murmur at the base is often present. According to DeLee it is usually hæmic in origin but may be due to displacement. Perhaps the former would be the case more often in early pregnancy, the latter in advanced pregnancy.

It is impossible to speak dogmatically with regard either to the quantity or the quality of the blood in pregnancy. According to Fries the total quantity of blood is not increased. Others dispute this. Williams and his assistants report that the blood-pressure is increased. This is denied by Hirst and others.

As regards the composition of the blood there seems to be little demonstrable change. It was formerly taught that there is a hydræmia or, as it is sometimes called, " physiological anæmia," during pregnancy. This idea, which is *a priori* improbable, has not been confirmed by modern investigators. That there is often a transient anæmia, however, during the early months is a matter of common observation.

On the whole the result of much work by different investigators has given us little information. The number of red corpuscles and the amount of hæmoglobin are about the same as in the non-pregnant condition. Zangemeister and Peyer have noted a decreased alkalinity of the blood. To my mind this denotes a slight suboxidation which, as stated elsewhere, I believe to be a common accompaniment of pregnancy. Our methods of examining the blood still leave much to be desired and there are doubtless changes which cannot be detected by our present methods.

Neu has observed an increase in the adrenalin content, and various others an increase in the cholesterin content.

During the latter months of pregnancy there is a leucocytosis which becomes quite marked during labor and continues, as we shall see later, during the first few days of the puerperium. The exact cause of this is not clear but the fact should not be forgotten since in a doubtful case the demonstration of a leucocytosis might lead to an unwarranted diagnosis of infection and to undeserved censure of the attendant.

Partly as the result of pressure, but chiefly as the result of the great hypertrophy of the venous channels in the uterine wall and the attendant enormous increase in the venous return, the circulation in the lower limbs is embarrassed and varicosities are so common that unless of unusual size they attract little attention. In some cases, however, they are not only the cause of great discomfort but a source of actual danger since rupture with severe hemorrhage may occur.

Hemorrhoids, which are nothing more than varicose veins of the rectum, are very common in pregnancy and varicosities of the vulva may reach an enormous size. It is important to remember that congestion and varicosities of the mucous membrane of the bladder may cause marked changes in the urine. These we will presently consider.

Sometimes the interference with the venous return causes marked swelling of the feet and legs, a condition which may be mistaken by the unwary for an œdema due to toxæmia. The presence of enlarged veins, however, and the fact that the swelling promptly disappears if the patient is kept for a day or so in the recumbent position should suffice to settle the question. Moreover, the swelling caused by venous obstruction is often unilateral, which of course would not be the case in an œdema arising from some general condition.

Minor disturbances of the circulation, faintness, dizziness, palpitation, etc., are common in pregnancy, especially during the early months. They seem to accompany the anæmia and nervous depression so common at this time. In later pregnancy they are due to pressure of the growing uterus upon the stomach or diaphragm, or perhaps to toxæmia and suboxidation.

Changes in the Respiratory Apparatus.—Toward the end of pregnancy the excursions of the diaphragm are limited and the ascent of the fundus causes some compression at the base of the lungs. In cases of great distention, *e.g.*, hydramnion or twin pregnancy, dyspnœa may be extreme, even necessitating the induction of labor. According to Dohrn there is usually a compensatory widening of the lungs.

Zuntz and Williams claim that while the total amount of air inspired is increased there is no material change in the amount of oxygen consumed or of carbon dioxide given off. According to DeLee the respirations are increased in frequency (26 to 28) and the excretion of carbon dioxide is greater. The latter view seems to accord better with the fact that in pregnancy the maternal blood must oxidize a great excess of nitrogenous material in the processes of fetal and placental metabolism.

There is in some cases a tendency to congestion of the nose and throat. The voice may be affected in singers. Laryngeal tuberculosis makes rapid progress. Typical attacks of bronchial asthma may occur, disappearing after delivery. The asthmatic condition, however, is probably a neurosis.

Slight subjective dyspnœa is common in pregnancy. The patient is oppressed in crowded or ill-ventilated rooms and longs for the fresh air and the open country. I believe this to be due to suboxidation accompanying a slight or unrecognized toxæmia. More pronounced dyspnœa is strongly suggestive of true nephritis complicating pregnancy.

Changes in the Alimentary Canal.—Custom and convenience have often led to the inclusion of the vomiting of pregnancy among the alimentary changes, but it is usually, I think, a neurosis. Occurring at an early period of pregnancy and disappearing in a few weeks it is so common as hardly to be considered abnormal. We will consider it in connection with the diagnosis of pregnancy and again in connection with the pathology of pregnancy.

Occurring in the latter months of pregnancy it is usually an evidence of toxæmia. In some cases it denotes impending eclampsia. Severe epigastric pain may also denote the outbreak of an eclamptic attack.

Ptyalism, or excessive flow of saliva, which is probably, also, of neurotic origin, will be described in connection with the management or with the pathology of pregnancy, as will also stomatitis, and the so-called longings. Most of the symptoms and conditions occurring at this time, that are supposed to be of gastric origin, have nothing to do with the stomach at all.

Constipation, so common as to excite little attention, is due partly to simple mechanical obstruction, partly to intestinal paresis from pressure, and partly to loss of power in the abdominal muscles from distention. This important subject will be discussed in connection with the management of pregnancy.

Toward the end of pregnancy the liver is displaced upward and to the right while the stomach is pushed upward and to the left. This displacement is of clinical importance if one has occasion to map out these organs by percussion, but it is not usually productive of symptoms. Some patients are annoyed by heartburn.

The careful and extended work of Hofbauer has shown that the functional overstrain to which the liver is subjected during pregnancy causes beginning fatty changes even in a large proportion of cases approximately normal. To my mind this is best explained as the result of the extra work required of this organ in the oxidation of the great nitrogenous excess of pregnancy.

Probably these changes are the accompaniment of many cases of mild toxæmia not sufficiently pronounced to present typical symptoms.

Jaundice, catarrhal inflammation of the bile ducts, and gall-stones are more common during pregnancy and will be considered in connection with its pathology.

On the whole the changes in the digestive tract are not usually very pronounced. One is often astonished to see how in spite of the pressure of the enormously enlarged uterus upon all the abdominal viscera, and the demand upon the mother's reserve power to supply the needs of the growing fœtus, her nutritional equilibrium is undisturbed and her general health perhaps even better than usual.

Changes in the Glandular System.—Owing to the increased circulatory activity, the lymphatic glands all over the body are hypertrophied. As already mentioned, this is especially true of those of the parametrium.

Very interesting, though not as yet well understood, are the changes in the ductless glands. The thyroid gland usually undergoes moderate hypertrophy during pregnancy. Now and then there is marked enlargement which, however, disappears after delivery. The significance of these changes is not known. The alleged relation of the thyroid gland and its secretion to the toxæmia of pregnancy and to eclampsia are discussed elsewhere. Personally I do not believe that it is a specific relation, but that if thyroid extract does good in this condition it is by its stimulating effect upon general metabolism and especially upon the oxidative processes.

The suprarenal capsules become hypertrophied and, as noted above,

there is an increase in the adrenalin content of the blood. There is also an enlargement of the pituitary body. Why this should occur we do not know but it is clear that there is some unexplained relation between the secretion of this gland, and uterine activity. The therapeutic value of pituitrin in selected cases in the stimulation of labor pains and its alleged relation to the secretion of milk are considered elsewhere.

Changes in the Urine and Urinary Tract.—Careful examination will show that about ten per cent. of all specimens contain traces of albumen. Perhaps in one-half of these cases the slight albuminuria is due to transudation through the congested mucous membrane of the bladder, in other cases it is the result of admixture of leucorrhœal discharge.

As a general rule, however, the presence of albumen in quantities sufficient to be detected by the usual heat or nitric acid tests means that toxæmia is present, and if a careful examination is made symptoms will usually be found. This important subject will be carefully considered in connection with the pathology of pregnancy.

The total quantity of urine is increased and its specific gravity diminished. A diminished quantity indicates the death of the fœtus. Acetonuria is common but its significance is not known. It was formerly supposed to indicate the death of the fœtus but this idea has been shown to be erroneous.

It is important to note that sugar is often found in the urine of pregnancy. Using Fehling's test Williams found sugar in five per cent. of his cases in the last month, and it has been shown by other observers that sugar in small quantities is present much oftener in pregnant than in non-pregnant women. In most cases, however, the condition is one of lactosuria. It is milk sugar, not glucose, that is present, the condition being due to absorption from the breasts. Of course the clinical evidences of diabetes are absent.

It was formerly taught that diabetes is common during pregnancy. This has not been my observation and I have no doubt that the idea arose from the fact that milk sugar is so often present. In case of doubt the polariscope will enable us to determine whether we have to deal with glucose or milk sugar. This subject is further considered in connection with the pathology of pregnancy.

The output of urea is less in the pregnant than in the non-pregnant state. Just the opposite of what we would naturally expect. My attention was drawn to this fact long ago in examining the urine of out-patients at the New York Polyclinic. At that time certain writers held that a small excretion of urea was an indication for the induction of labor, and I have no doubt that many labors were unnecessarily induced for that reason.

While the amount of urea nitrogen is lessened that of the ammonia nitrogen and of the undetermined nitrogen is increased. The amino-acids are present in abundance.

On the whole the most significant and encouraging studies in the

urinalysis of pregnancy have been those made in connection with the now familiar nitrogen partition. These have shown, not only that less urea nitrogen is excreted during pregnancy than at other times, but that the urine contains large quantities of nitrogenous substances in a state of incomplete oxidation. The clinical bearing of these facts will be discussed in connection with the toxæmia of pregnancy.

The kidney may be dislocated into the pelvis by the pressure of the enlarging uterus. The ureters are swollen and sensitive and can be palpated with ease. The examining finger in the vagina feels the ureter where it passes over the pelvic brim. Compression of the ureters may convert a mild and previously unnoticed catarrh into a severe process just as pressure upon the bile ducts may do. Fortunately these things do not occur often. One wonders why they are not more frequent than they are. We will come to them again in connection with the pathology of pregnancy.

As explained in the next chapter frequent urination is one of the most common symptoms of early pregnancy. Toward the end this returns and now it is an indication of approaching labor. Here of course it is due to the pressure of the head. It is more marked in primiparæ, as in these cases the head usually descends into the cavity of the pelvis long before the beginning of labor.

As already mentioned the mucous membrane of the bladder shares in the general congestion and the cystoscope shows varicose veins at the base of the bladder. In some cases there is a transudation through the congested membrane and a resulting albuminuria. This albuminuria, however, is intermittent in character and unaccompanied by symptoms.

Varices of the bladder occasionally result in hæmaturia which may give cause for much anxiety and even give rise to the suspicion of placenta prævia.

Changes in the Skin.— With the increased activity of the general circulation and of the glandular system there is, in the latter months of pregnancy, an increased secretion of perspiration. The necessity for free elimination is very great at this time and nature seems to respond in this way to the increased tax upon her resources. This increased secretion continues and as we shall see becomes even more marked during the puerperium.

Pigmentation of the breasts is so common and characteristic during pregnancy as to constitute a means of diagnosis and will, therefore, be considered in the next chapter. The same thing may be said of the familiar *striæ or lineæ albicantes,* the result of distention of the skin.

But pigmentation is not confined to the breasts. There is also the familiar pigmentation of the navel and *linea alba.* This does not appear as a rule until the sixth month.

More rarely there is a development of single or scattered areas of pigmentation, especially about the face and neck—the chloasma of preg-

nancy. These areas are much lighter in color than those of the breasts and *linea alba* but are sufficiently well marked to be the source of much annoyance to sensitive patients. Among the laity they are often called "liver spots" since they are popularly supposed to be due to some disorder of the liver.

What is the cause of pigmentation in pregnancy? Wychgel has advanced the ingenious hypothesis that it is due to the presence of hæmoglobin that has survived the destruction of the red blood-corpuscles that occurs in pregnancy. He claims to have demonstrated that the pigment contains iron.

Toward the end of pregnancy there appear upon the surface of the abdomen and buttocks the *striæ* or *lineæ albicantes*, as they are called, short tapering bands of cicatricial tissue, pinkish or bluish-white in color, and depressed below the level of the surrounding skin. With the lapse of time they become a dead white in color and remain as silent witnesses of a previous pregnancy. They are not infallible witnesses, however, since they may be the result of distention. For example, they are found in cases of overdevelopment of the breasts, and when the abdominal surface is distended by any large tumor, and they have been noticed upon the biceps of the athlete. They are of no great value in the diagnosis of pregnancy since by the time they become well marked the other symptoms are usually quite sufficient. They are, however, of great value as corroborative evidence of multiparity, that is of the fact that the patient has at some time been pregnant.

Changes in the Mind and Nervous System.—Some patients experience a feeling of exceptional well-being during pregnancy. In a much larger proportion of cases, however, there are, even in pregnancy approximately normal, periods of depression which occur without apparent cause. The patient is depressed in spirits or perhaps has fits of irritability. Often she admits that she cannot explain the cause of her feelings. Cases of this kind are so common that they can hardly be considered abnormal. They usually occur in early pregnancy and doubtless represent the effect upon the nervous system of the anæmia and malnutrition so common at that time. With the advance of pregnancy they usually disappear. They are part of the price that woman has to pay for her share in the perpetuation of the race. In the event of strong hereditary predisposition, however, true insanity may follow, as we shall see when we come to discuss the pathology of pregnancy.

Changes in the Bones.—The proverbial toothache is doubtless due to the fact that calcium in large quantities must be supplied for the upbuilding of the fœtus. Osteomalacia, rarely seen in this country, is an extreme instance of calcium deprivation, but there are probably intermediate forms not usually recognized. Deficiency in calcium has been held to be the cause of eclampsia. Calcium is an oxygen carrier and doubtless a lack of it predisposes to suboxidation. An unexplained phenomenon of

gestation is the production of the so-called puerperal osteophytes, newly-formed plates of bone on the internal surface of the skull. Their presence is not constant and nothing definite is known as to their origin or significance. They are not peculiar to pregnancy, however, as they have been found in syphilis and tuberculosis.

General Nutrition and Metabolism.—As already noted patients are often more or less depressed, both mentally and physically, during the

FIG. 19.—Abdominal striæ.

early months of pregnancy. Anæmia and moderate loss of flesh are common. After the first few months, however, the organism seems to become accustomed to the new conditions, the patient begins to gain in weight, her color and general condition improve, and the improvement continues, barring accidents, until the end of pregnancy.

It is a natural assumption that a process as profound and far reaching as pregnancy would be accompanied by metabolic changes easy to recognize, but this has not yet proved to be the case. Nature has here drawn

a veil which clinical study and laboratory research have alike failed to penetrate.

The reader will already have noticed that there is marked difference of opinion as to such elementary matters as the quantity and composition of the blood, the character of the respiratory exchange, and the effect of pregnancy upon the heart and the blood-pressure.

We have already referred to the fact that pregnant women excrete a relatively small amount of urea and this too in spite of the fact that there is an excess of nitrogenous waste to be disposed of. This, as well as the relatively very rapid increase in weight during the last few weeks of pregnancy, seems to indicate a storage of nitrogen to provide for the active necessities of fetal and placental metabolism. The great burden of oxidizing this excess of nitrogen and of disposing of waste products falls upon the liver and kidneys, especially the former. This is shown, not only by theoretical considerations and by what we have recently learned of the work done by the liver in the process of oxidation, but also by the results of autopsies in those cases in which these organs have finally broken down under the strain of a profound toxæmia, finally resulting in the outbreak of eclamptic convulsions.

It is evident that, in order to keep pace with the enormous increase in nitrogenous metabolism that is an inevitable accompaniment of pregnancy, the oxidative processes must be kept at the highest pitch of efficiency. My own views upon this subject, which differ radically from those of other workers in this field, are given in connection with the toxæmia of pregnancy.

CHAPTER II

THE DIAGNOSIS AND CLINICAL PHENOMENA OF PREGNANCY

The diagnosis of pregnancy is one of the most important subjects in medicine and one of the least understood. Mistakes are constantly made, even in cases perfectly normal.

In my opinion, difficulty in diagnosis is due to three factors:

1. The failure to distinguish between the presumptive and the positive evidences of pregnancy. This is chiefly the result of defective text-book classification.

2. Unfamiliarity with the bimanual examination, and with the size, shape and consistency of the normal uterus. This is due to defective gynæcological training.

3. Unfamiliarity with the bimanual examination of early pregnancy, and with the physical diagnosis of advanced pregnancy, especially the mapping out of the fetal parts and the auscultation of the fetal heart. This is due to the lack of proper obstetric training the world over. I do not mean that the training is not often good, but that there is not enough of it. The physical diagnosis of pregnancy is certainly as important as that of the heart and lungs; indeed, from the standpoint of results, it is more important. But how little attention it receives! I have often been impressed by the fact that the best diagnosticians that I meet are the house surgeons in maternity hospitals.

In considering the diagnosis of pregnancy most writers divide pregnancy into three periods of three months each, three trimesters, as they are often called. This, it seems to me, serves only to complicate the situation. Pregnancy should not be divided according to months, but according to its clinical characteristics. More rational is the division adopted by the French writers, *viz.*, the division of pregnancy into two parts; the first half, or the period of doubt, and the second half, or the period of certainty. To be sure this requires some qualification. In normal cases, the experienced accoucheur is seldom in doubt after the first six weeks or two months, while in cases complicated by large tumors he may be obliged to reserve his decision until the patient is far advanced in pregnancy. For the great majority of cases, however, this division holds good. It is a perfectly logical one, because it is in the second half of pregnancy that the three positive signs of pregnancy appear. The term "half," however, need not be used in a strictly literal or mathematical sense. The division is approximate rather than exact. In many cases pregnancy will be somewhat more than half over before any one of the three positive signs mentioned above can be demonstrated.

For purposes of diagnosis then, we divide pregnancy into two periods.

In considering the diagnostic evidences of each we divide these evidences into two classes—symptoms and signs.

This ancient classification is convenient and practical. The symptoms of pregnancy are, in the main, subjective, or at least they are first noted by the patient. While highly suggestive and valuable they are not absolutely infallible since they may possibly have causes other than pregnancy. Moreover, they may be simulated or denied. Morning sickness and cessation of the menses are examples of the "symptoms" of early pregnancy and "quickening" is a symptom that usually ushers in the second half of pregnancy.

"Signs," on the other hand, are amenable to inspection, palpation and auscultation. They cannot be simulated, and it is useless to deny them. Among the signs of pregnancy are found those which in the early months of pregnancy are almost positive, *viz.*, the local changes in the uterus, and those which in the second stage are absolutely positive, *e.g.*, the recognition by a competent examiner of the fetal heart sounds, the fetal movements, and the different parts of the fœtus. These signs can only be caused by the presence of the fœtus itself. It is only during the latter months of pregnancy that they are sufficiently well developed for positive recognition.

Even in the first period the physical signs are, in doubtful cases, more valuable than any mere symptoms can possibly be.

These facts clearly show that one cannot learn how to diagnose pregnancy by reading books, or by listening to lectures, but only by actual clinical practice.

Let us begin then with the first period, the period of doubt. What are the early symptoms of this period? In other words, what are the earliest symptoms of pregnancy?

Cessation of Menstruation.—First, and most important of all, is the cessation of the menses. Most women indeed make their own diagnosis from this symptom, and as a rule, correctly. There are, however, certain exceptions which should be firmly fixed in the mind of the beginner. Lactation is the most common cause of absence of menstruation during the child-bearing period. It is true that women do not ordinarily conceive during lactation, but there are many exceptions to this rule.

It is the observation of every physician that nervousness and apprehension, the result of an undesired, or possibly an illegitimate pregnancy, may delay the advent of the menstrual period. It may be absent for long periods in conditions of profound anæmia, especially in young women and girls, or after severe hemorrhage, *e.g.*, in cases of abortion or placenta prævia. Again conception may occur in young girls before the establishment of the menstrual flow, and it has been known to occur in women of middle age after menstruation had apparently ceased.

Then, too, there may be one or more periods or pseudo periods after conception. A single menstruation after conception lasting but a day or

two, the discharge being light in color and small in amount, is not at all uncommon, and may lead to a mistake of four weeks in estimating the date of labor. The attendant should always recall this and not forget to question his patient upon this point.

We hear sometimes of patients who are said to menstruate regularly during pregnancy. Most of these cases are apocryphal, although menstruation is of course mechanically possible before the fusion of the decidua and the decidua reflexa, which occurs at about the fifth month. Every case of supposed menstruation during pregnancy should be investigated in order that the source of the hemorrhage may be determined. It may indicate a decidual endometritis, or a molar pregnancy, and it may forebode an abortion. In the latter months it may indicate placenta prævia.

The Nausea of Pregnancy.—Next in importance as a symptom of early pregnancy is the nausea of pregnancy, or " morning sickness," to use an expressive term that has become imbedded in the popular vocabulary, and in the literature of the subject as well. While not a necessary part of normal pregnancy, it is nevertheless so common, especially in primiparæ, that in its milder forms it is hardly regarded as pathological. Few patients escape some traces of this unpleasant symptom. It is usually first noticed about the third or fourth week, but some women are nauseated almost from the moment of conception. It is usually most marked when the patient first assumes the erect posture in the morning, but it is not necessarily confined to the morning hours, and may occur at any time of the day. I recall one patient who was nauseated only in the evening. Sometimes there is only nausea, at other times both nausea and vomiting. More rarely there may be neither, but only complete loss of appetite, or perhaps a pronounced aversion for food.

The vomiting of pregnancy in its milder forms is probably a neurosis and in its more severe a toxæmia. Some writers believe that toxæmia underlies even the mild cases. Vomiting occurring in the latter months of pregnancy may forebode eclampsia, and should remind us not to omit urinalysis.

Morning sickness, when occurring in women who have been exposed to the possibility of conception, and who have been free from indigestion or nausea before pregnancy, is a corroborative symptom of great value. It is also, as DeLee remarks, an evidence of the life of the child, since we know that vomiting usually ceases with the child's death.

It is not an absolutely reliable symptom, however. In the first place, it may be simulated, or its existence falsely asserted. If a patient states that she is nauseated, or vomits in the morning, there is no way of absolutely disproving her statement. Again it may be the result of suggestion as in pseudocyesis or spurious pregnancy. Hirst notes that the husband is sometimes affected and two or three instances of this peculiar phenomenon have fallen under my observation.

Somewhat akin to morning sickness, though much less common, are an excessive secretion of saliva, and the so-called longings for unusual and perhaps previously disliked articles of diet.

Frequent Urination.—This symptom, although given little or no attention by many writers, is in my experience one of the most common evidences of early pregnancy, and one with reference to which I never fail to question the patient. The existence of this symptom is not usually falsely asserted or denied since most patients, apparently, are not familiar with the fact that it is an evidence of pregnancy.

What is the cause of frequent urination in early pregnancy? It is usually attributed to pressure upon the bladder by the growing uterus, but it is often observed very early before enlargement can have taken place. According to DeLee it is not due to pressure from the pregnant uterus because the specific gravity of the latter is only about the same as that of the intestines, but is due to stretching of the base of the bladder by the backward displacement of the cervix which attends the usual anteversion of the pregnant uterus.

Increased Vaginal Secretion.—This is often noticed by the patient, who is not likely to mention it, however, unless asked. It is the natural consequence of the congestion of the entire birth canal and pelvic contents, already mentioned, and, occurring in patients not previously subject to leucorrhœa, has considerable diagnostic significance.

Symptoms Referable to the Breasts.—We will speak presently of certain changes in the breasts and nipples that are characteristic of pregnancy. These are apparent to the eye and belong among the signs of the condition. Before these signs appear, however, certain patients experience peculiar sensations in the breasts, fugitive pains, a feeling of tension or "prickling." These are of some value as corroborative evidence; indeed, in multiparæ they are of more value than the changes apparent to the eye, since the latter may be the result of a previous pregnancy.

Mental and Nervous Changes.—As noted in the foregoing chapter, changes in disposition and mental outlook are common in early pregnancy. They are of considerable corroborative value to those who know the patient well, and especially to those who have been with her in previous pregnancies; for example, to her family and her family physician.

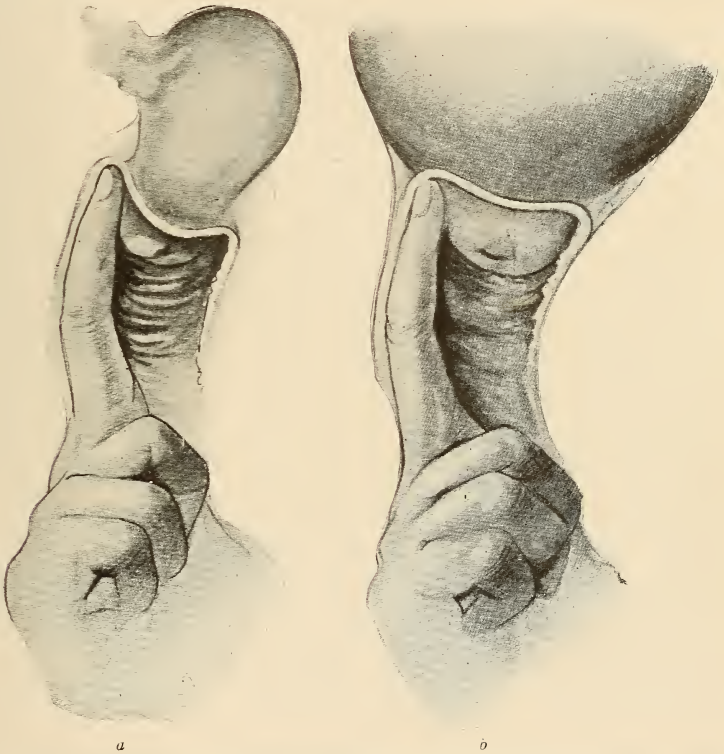
These changes commonly take the form of irritability, despondency, and nervous apprehension. They are a part of the general depression that goes with the early months of pregnancy, and fortunately does not usually outlast them.

Much more rarely the patient manifests a cheerfulness foreign to her usual disposition. There are some women who feel better both mentally and physically during pregnancy than at any other time.

The reader will notice at once, that for the most important of the evidences of pregnancy thus far considered, we are obliged to depend

upon the statements of the patient. When these statements can be relied upon they are of great value, and there is usually little difficulty in making a diagnosis. As a rule it has already been made by the patient herself, and made correctly. Moreover, in these cases no immediate diagnosis is necessary, and it is always possible to wait a few weeks for additional evidence.

But let us suppose that definite information is desired. Perhaps we do not know the patient, or, if we do, we may have reason to distrust her statements.



a *b*

FIG. 20.—Sensation imparted to the palpating finger by (*a*) the non-pregnant uterus, (*b*) the pregnant uterus.

Under these circumstances there is but one way to obtain reliable information, and that is to search for those physical signs of pregnancy that cannot be simulated. These are, in the early months, the changes in the size, shape, position and consistency of the uterus. These changes are highly characteristic, and the experienced observer is seldom deceived.

It is self-evident that before one can recognize the changes of early pregnancy, he must be familiar with the size, shape, *etc.*, of the normal uterus in the non-pregnant condition. It is absolutely necessary that he

be familiar with the methods and results of the ordinary bimanual gynæcological examination. If he does not know the normal uterus he will seek in vain for those deviations from the normal that mark the early months of pregnancy.

In the next place he should become familiar by actual exploration with the changes that do occur in early pregnancy. This knowledge can only be gained by practice. He should, therefore, from the beginning of his career, never neglect the opportunity of examining women in the early months of pregnancy. In this way the persevering and intelligent young physician will soon master the problem.

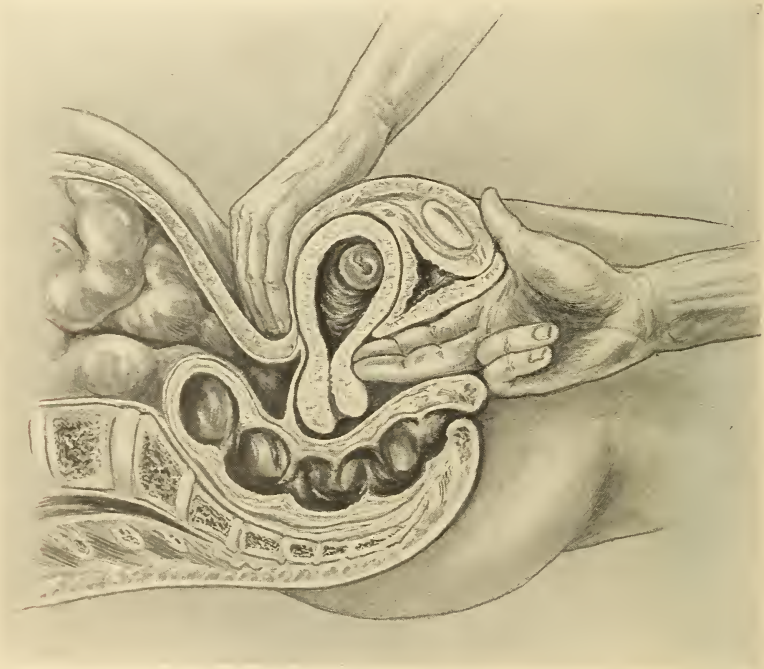


Fig. 21.—Hegar's sign.

Changes in the Uterus.—What then are the changes to be noted? In the first place the uterus is larger than in the non-pregnant condition, and since its normal anteflexion is increased, the finger carried into the anterior *cul de sac* notes this enlargement at once. What strikes the novice making his first examination is that instead of having to search for the body of the uterus, *he cannot help feeling it.* At six weeks the enlargement is quite noticeable, and the practiced hand can detect it two or three weeks earlier.

At the same time the examiner notes a very remarkable change in the

consistency of the uterus; a change more easily recognized than described. The body of the uterus instead of being smooth, firm, and hard, as in the virgin or non-pregnant state, has a doughy feel. One detects slight irregularities here and there. The uterine body is as a whole fairly symmetrical, although careful examination will sometimes show an anteroposterior thickening, greater on one side than on the other. This is known as the sign of Braun von Fernwald, and is due to the presence of the ovum in one upper angle of the uterus. Later the growing ovum completely fills the uterine cavity, and the irregularity disappears.

The cervix is softer than in the non-pregnant condition, a sign of some value but far less significant than the signs referable to the body of the

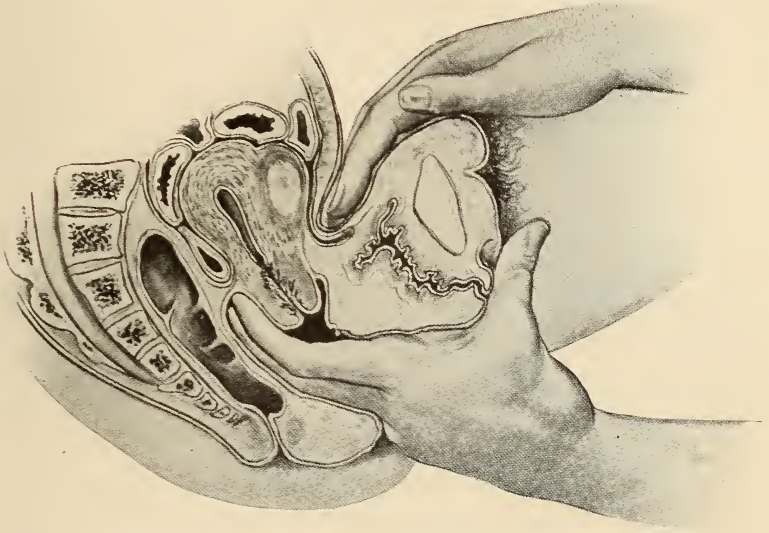


FIG. 22.—Hegar's sign. Negative, uterine hypertrophy being due to a fibroma.

uterus. A writer, given to homely but effective comparisons, once said that in the non-pregnant condition the cervix feels like the tip of the nose, while in pregnancy it feels like the lips. A more accurate comparison is that of Fabre, who says that the cervix in pregnancy feels like a hard body covered with velvet. The thoughtful examiner will notice that the softening of the cervix is more superficial than that of the uterus.

The cervix is much shortened, or, at least, it appears to be shortened. This is due to the distention and consequent globular shape of the lower uterine segment. The examining finger passed into the *cul de sac,* instead of running along a gradually increasing curve as in the non-pregnant condition, comes squarely up against the lower segment of the uterus. This is one of the most important and most easily recognized signs of early pregnancy. While it does not easily lend itself to written description, it is made perfectly plain in Fig. 20.

Hegar's Sign.—But it is the lower uterine segment that gives us what is perhaps the most significant and positive sign of early pregnancy. The lower uterine segment becomes much softer than the cervix. So soft, indeed, does it become that in its empty state (for it has not as yet become encroached upon by the growing ovum), it can be compressed almost to the thinness of paper. This gives us what is known the world over as Hegar's sign, to which it is well worth our while to devote careful attention.

Figs. 21 and 22 show how to elicit Hegar's sign. The two fingers in the anterior *cul de sac* are made to meet the fingers of the external hand.

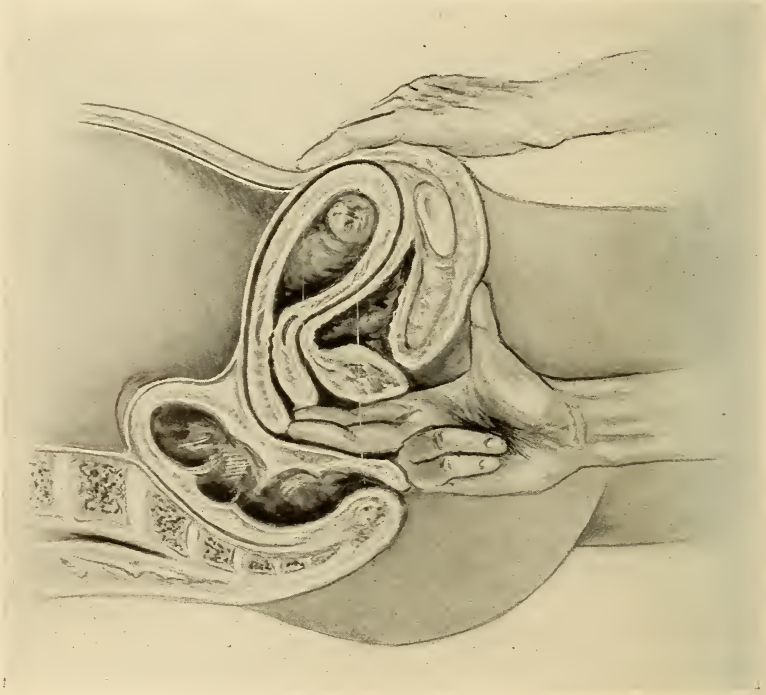


FIG. 23.—McDonald's sign.

The softened lower uterine segment offers no resistance, and the fundus feels like a tumor completely separated from the cervix, or attached to the latter by a pedicle. Indeed, this mistake has been made many times by those unfamiliar with obstetrical manipulations, the cervix being taken for the body of the uterus, and the latter for a new growth. Hegar's sign is available at about the tenth week, sometimes a little earlier. That there are changes in the lower uterine segment, however, that can be recognized even before this time, cannot be doubted in view of the evidence of various skilled observers.

McDonald's Sign.—McDonald claims that during the first month of pregnancy it is possible to flex the cervix upon the body of the uterus in such a way as to bring the two into contact. This of course is another way of demonstrating the softening of the lower uterine segment. According to McDonald this increased flexibility of the cervix can be made out before softening is appreciable to the touch (Fig. 23).

Ladinski's Sign.—Ladinski's sign is one of the most valuable evidences

Fig. 24.—Ladinski's sign.

of early pregnancy, and can often be demonstrated before either McDonald's or Hegar's signs are available. It depends upon the presence in the anterior wall of the uterus just above the cervical junction of a soft, elastic, fluctuating area. According to Ladinski this can frequently be made out as early as the fifth week, when it is the size of a finger-tip, and always in the sixth week. This area increases in size during the first three months until it is gradually lost in the general and complete softening of the lower uterine segment. In marked retroflexion it is found on the posterior uterine wall but does not appear until about a week later (Fig. 24).

Ladinski also claims that the presence of this sign serves to differentiate normal from extra-uterine pregnancy, and also that the elastic

area becomes soft, doughy and incompressible with the death of the fœtus, thus permitting one to distinguish between threatened and inevitable abortion.

The sign is not difficult to elicit. It is only necessary to fix the body of the uterus by external pressure, meanwhile palpating its anterior surface from cervix to fundus.

Failure to elicit Hegar's sign as well as the other physical signs of early pregnancy is due, not so much to any intrinsic difficulties in the subject, as to lack of clinical experience on the part of the examiner, and to improper technic in the conduct of the examination. Of the first I have already spoken. A few words with reference to the second may not be out of place.

Whenever practicable the examination should be made upon a table, not upon a bed. The patient should be in the dorsal position with the knees moderately flexed and the head and shoulders slightly raised. In this way the greatest relaxation is secured.

Two fingers of one hand are carried into the anterior *cul de sac,* noting meanwhile the condition of the cervix. They are introduced slowly and carefully. Rough and hasty manipulations make satisfactory examination impossible. The patient should be assured that the examination will be attended by little or no pain, and encouraged to relax her abdominal muscles and to breathe with her mouth open and with prolonged expirations. The external hand applied to the abdomen should be depressed very slowly, in order not to frighten the patient and excite involuntary resistance. It should not be applied too low, *i.e.,* too near the symphysis, or it will not be carried above and behind the uterus, as is absolutely necessary. Should the examiner find the anterior *cul de sac* empty, he should not hastily conclude that pregnancy is out of the question, but remember that in the early months the uterus is occasionally, if rarely, retroflexed.

Now and then one meets a patient with an abdominal wall so thick as to make satisfactory bimanual examination impossible. In such cases Hegar's sign may sometimes be obtained by passing the thumb into the vagina and the finger into the rectum. As a rule, however, the employment of pain-producing measures, or those requiring anæsthesia, is to be avoided, not only out of regard for motives of delicacy and humanity, but also because of the danger of abortion. They are to be used only in those cases in which an immediate diagnosis is a matter of vital importance.

To sum up, the most valuable, and the only really positive signs of pregnancy in the early months are those obtained by bimanual exploration. When the practiced hand finds the changes described above, pregnancy is almost proven. If, at an examination made two or three months later, the same characteristic changes are verified, and the uterus has in the meantime enlarged symmetrically, pregnancy can hardly be doubted. *But the required knowledge and experience are presupposed.* Where these

are lacking the attendant should beware of making anything more than a provisional diagnosis. If in doubt, he should frankly say so, stating that more time will be required for a positive diagnosis. For this no one can blame him; but if he makes a positive diagnosis which proves incorrect the result will be embarrassing.

Let me repeat that the diagnosis of pregnancy, and especially of the first half of pregnancy, cannot be learned from books. As well attempt to learn watchmaking from books without ever seeing or handling the inside of a watch. The ambitious student should make up his mind at the start that proficiency in this work can be gained only by actual practice, using the method outlined above. *There is no other way.*

Inspection.—During the early months little is to be gained by inspection. The abdomen is still flat, perhaps even more so than usual. The rhyme of Madame Lachapelle, *Ventre plat, enfant il y a,* has become an obstetrical classic. But such negative information is of little value. Toward the end of the fourth month, beginning enlargement of the abdomen can be made out, but before this there is usually nothing to be seen, though the patient may complain that her clothes are a little too tight.

With the advance of pregnancy, the fundus rises in the abdominal cavity, and the navel, at first flat, becomes depressed and later protrudes. The ascent of the uterus, and the height which it attains at different periods of pregnancy, are considered elsewhere, and we shall see later how it finally reaches the neighborhood of the ensiform cartilage only to descend three weeks before labor.

Swelling of the breasts and prominence of the superficial veins may attract attention. The primary areola and the tubercles of Montgomery may be quite noticeable at the sixth week. All these changes, however, may be absent. The secondary areola and the pigmentation of the *linea alba* do not come until later.

I believe, though I have not seen it in print, that there is such a thing as the facies of early pregnancy; not always present, it is true, but present in a considerable number of cases, a certain pallid and haggard appearance, and a facial expression, difficult to describe, but sufficiently obvious to the experienced observer. Dark lines under the eyes are common.

Chadwick's Sign.—Another sign which usually makes its appearance about the third month, sometimes earlier, and continues throughout pregnancy, becoming more marked toward the end, is the deep violet color of the visible mucous membrane about the vulva and vagina, and especially that of the vestibule and anterior vaginal wall. It is the result of the congestion of the entire birth canal that accompanies pregnancy and is made more marked by anything that increases the congestion, *e.g.*, the pressure of the head in cases of pelvic contraction, or the presence of a large tumor, or the general congestion of mucous membranes that characterizes certain forms of cardiac disease. Its value is only corroborative.

Chadwick, of Boston, was the first American to describe this phenome-

non in detail, and since the publication of his paper in 1886, it has been known as Chadwick's sign.

During the fourth and fifth months the uterus continues to increase steadily in size, and this helps to confirm the diagnosis which has by this time usually been made. This steady and rapid growth of the uterus is in itself a very valuable sign of pregnancy. *No morbid growth increases in size as fast as does the pregnant uterus.*

This period of pregnancy is marked by the appearance, or possible appearance, of three important signs relating to the fœtus. For the most part, however, they are not sufficiently marked to be of much service until the patient is well along in the second period. I refer here to ballottement, quickening, and the fetal heart.

Ballottement.—This is one of the classical signs of pregnancy. It can be made out toward the end of the fourth month, but is best recognized during the fifth and sixth months. It is obtained as follows: One hand is placed over the fundus and pressed firmly downward so as to come in contact with the fœtus. Two fingers of the other hand are then passed well up into the vagina and made to touch the lower fetal pole, usually the head. This is pushed quickly upward by a sort of tapping movement. The hand at the fundus feels the impact of the ascending fœtus, and the fingers in the vagina feel its return. After the sixth month, the fœtus does not float in the now relatively small amount of amniotic fluid, and this sign is no longer available. In cases of hydramnion, however, it can be practised up to the very beginning of labor.

As a rule, by the time that ballottement can be satisfactorily practised the other evidences of pregnancy are sufficiently definite. Nevertheless, this sign is highly characteristic and in doubtful cases of considerable value. It is particularly useful in patients who are so stout that a satisfactory bimanual examination is difficult or impossible. Other conditions said to simulate it are stone in the bladder and an anteverted uterus, or a pediculated tumor, swimming in ascitic fluid. The latter is the only one that seems within the range of probability.

A sort of external ballottement is sometimes practised, the patient lying upon her side, and the examiner using his hands as in trying to recognize the impulse of ascitic fluid.

Quickening.—Toward the end of the first period a new evidence of pregnancy is observed, one which is always of great interest to the patient, and is usually eagerly welcomed. Ancient custom has given it the suggestive title of quickening. By this term is meant the sensation caused by the contact of the fetal parts with the endometrium during active movements of the fœtus. It is usually observed earlier in multiparæ than in primiparæ. It is described by the patient as a faint, wavy or fluttering sensation, which she appreciates but finds it hard to describe. With the advance of pregnancy the movements become more pronounced. Like the

contractions of pregnancy they are more noticeable at night when there is less to distract nervous attention than in the daytime.

In some cases the fetal movements are quite painful to the mother. This has been attributed to undue sensitiveness of the uterine wall, the result of an old endometritis, and it has been remarked that in such cases the uterus is tender on pressure. Sometimes, even in advanced pregnancy, fetal movements may be absent for days at a time, though the life of the fœtus is attested by the fetal heart sounds.

Standing by itself the sensation of quickening, as described by the patient, is not of great value. Highly nervous patients may imagine it and of course it may be simulated. Movements of gas in the intestine and spasmodic contractions of the abdominal muscles have been mistaken for fetal movements.

The perception of fetal movements by the examiner, however, is, as we shall presently see, of the greatest possible importance. Rarely fetal heart movements may be felt externally, especially in face presentation in which the fetal thorax is crowded against the mother's abdomen.

The funic souffle is a high-pitched blowing or whistling sound, synchronous with the fetal heart and often intermittent, *i.e.*, it will be heard at one examination and absent at another. It is probably produced by some temporary obstruction in the umbilical arteries since it is occasionally produced by the pressure of the stethoscope. This is a valuable sign when present but it is often absent.

The uterine souffle is a blowing sound of lower pitch as of fluid rushing through a large tube, heard synchronous with the maternal pulse and caused by the current of blood in the uterine arteries. It was formerly but incorrectly called the placental souffle. While suggestive, it is not of any great diagnostic value, since it only indicates enlargement of the uterine arteries and such enlargement occurs in other conditions, *e.g.*, in fibroid or ovarian tumors. It is best heard upon the left side since, owing to the right obliquity of the uterus already mentioned, the vessels are here nearer the surface. According to some writers it may indicate the position of the fœtus in ectopic gestation.

The Fetal Heart.—The recognition of the fetal heart sounds is positive evidence of pregnancy, but while it is occasionally possible to hear them during the first four and one-half months, this sign is not usually available until later. Moreover, these sounds are by no means as distinct in the seventh and eighth months, as in the ninth and tenth. This sign then belongs to the second period of pregnancy.

It will be convenient to consider here three classes of symptoms, which, beginning early in pregnancy, continue during both the first and second periods, indeed up to the beginning of labor, *viz.*, the changes in the shape and size of the abdomen, the changes in the breasts, and the painless contractions of pregnancy.

Changes in the Abdominal Tumor.—Abdominal distention is not

apparent to the eye until the end of the fourth month. At five months the fundus is about half-way between the symphysis and the umbilicus. From this time the fundus gradually rises until about three weeks before term, when it reaches its highest point, the epigastrium, and then sinks to a lower position as the head becomes engaged in the pelvic cavity. At six months the fundus has reached the navel, which has now ceased to be

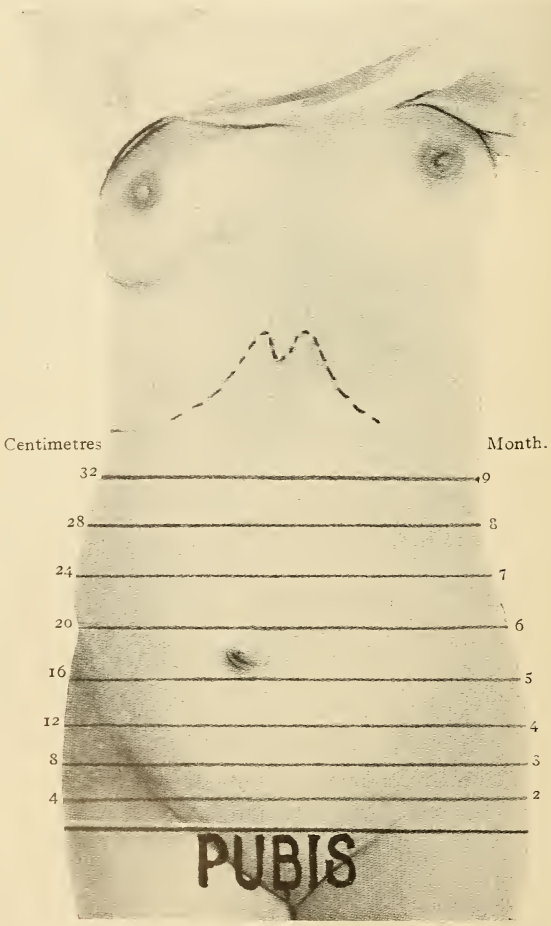


Fig. 25.—Height of fundus at different periods of pregnancy.

a depression and later protrudes. From this point on it rises at the rate of about 4 cm. per month until it nearly reaches the xiphoid cartilage, then sinks as above. In multiparæ the descent of the fundus does not begin until a week or ten days before term and is much less marked.

The landmarks usually given, however, are often unreliable. The

height of the umbilicus is variable, and, in "long-waisted" women, the xiphoid cartilage and the false ribs are much higher than in others. Hence the distance of the fundus above the pubis is a better criterion. Fig. 25 shows the distance of the fundus from the symphysis at different periods

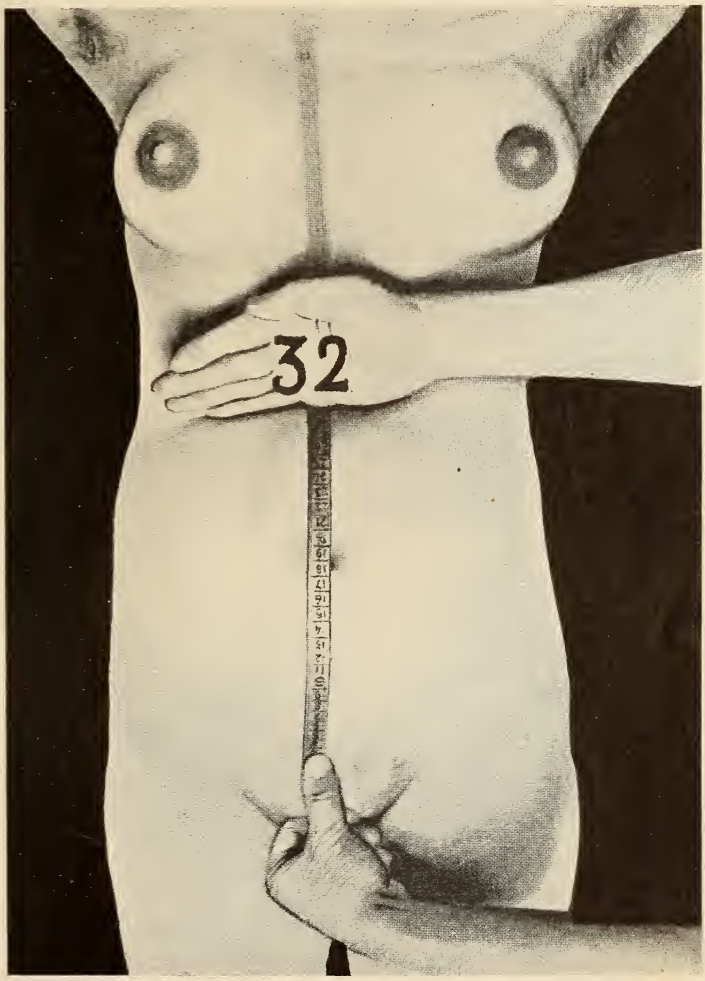


FIG. 26.—Measuring height of fundus at term.

of pregnancy, and Fig. 26 the method of measuring the height of the fundus at term. The advance of the fundus has been estimated at 4 cm. a month, and will be found to correspond pretty closely to this estimate.

Unusual height of the fundus may indicate some condition which

prevents the head from entering the pelvic brim, *e.g.,* contraction of the pelvis, or unusual size of the child. In twin pregnancy it may be markedly increased, and the same is true of hydramnion.

Changes in the Breasts.—Enlargement of the breasts may be noted as early as the second month. This enlargement is accompanied by the appearance of prominent superficial veins beneath the skin. Shortly after this a pigmented area appears about the nipple, the primary areola, and a thin, whitish, watery fluid can be expressed. Toward the middle of pregnancy this becomes yellowish, colostrum. It is not until about the sixth month that the secondary areola appears. The glands of Montgomery, enlarged sebaceous glands, white in color, are seen scattered through the primary and sometimes through the secondary areola, and presenting a striking contrast to the darkened surface about them. The nipple itself becomes darker and more readily erectile. Pigmentation is much more marked in patients of the brunette type. Under the skin one feels readily the hypertrophy of the gland proper, hard, rough, nodular and fissured. In blondes the nipple and areola become a deeper, or reddish, pink. Thus we see that in either case there is a deepening of the original color (Figs. 27, 28, 29 and 30).

The breast changes are of considerable diagnostic value in primiparæ, especially the secretion of a milky fluid. They are of less value in multiparæ, who often have a little fluid in the breast, especially if they have recently been nursing a child. Then, too, the pigment of a former pregnancy may remain.

Swelling of the breasts may occur during menstruation, and it may accompany extra-uterine pregnancy, spurious pregnancy, and pelvic or abdominal tumors.

In cases of great distention the breasts, as well as the abdomen, may become the seat of the *lineæ albicantes* already mentioned.

The Intermittent Contractions of Pregnancy.—From about the tenth week of pregnancy, the palpating hand recognizes a hardening of the uterus recurring at irregular intervals. This is caused by what are known as the intermittent contractions of pregnancy, or the painless contractions of pregnancy, or, as they are often called, after their discoverer, the intermittent contractions of Braxton Hicks. They may be appreciated either by external or internal examination. Of course the external method is not applicable until the fundus has risen well above the symphysis.

As a rule the contractions recur at intervals of five or ten minutes, but they may be hours apart. They have been observed not only in pregnancy, but also in fibroids and in hæmatometra. During the latter part of pregnancy these contractions become more frequent and more marked, and are often noticed by the patient herself, who remarks the hardening of the abdominal surface. They are not always painless but as labor approaches may become quite painful, especially in the early hours of the morning; so painful, indeed, that the patient and those about her may

FIG. 27.—Virgin blonde.

FIG. 28.—Pregnant blonde.

FIG. 29.—Virgin brunette.

FIG. 30.—Pregnant brunette.

think that labor has begun, only to find that the pains wear away as the day advances.

The contractions of pregnancy are of little diagnostic value in early pregnancy, since they may be absent for hours at a time, and, even if present, may be due to other causes. In the latter months they are, it is true, very characteristic, but by that time the other signs of pregnancy are usually amply sufficient. Strong, but painless, contractions occurring weeks or even months before term, may indicate the death of the fœtus.

I regard these contractions as the natural response of a hollow muscular organ to the reflex influence of distention. In my opinion they prepare the way for labor, and often dilate the cervix to a considerable extent, though the latter is denied by some writers. I have observed tension of the " bag of waters " during a painless contraction, long before the beginning of labor.

The Period of Certainty.—The latter half, or, to be more exact, the last three and one-half to four and one-half months, of pregnancy, are attended by the development of the three positive and unmistakable signs. Except perhaps in an occasional case of uterine tumor, or of great obesity, one or more of these signs can always be distinguished by the experienced examiner.

What are these signs?

1. The fetal heart sounds.
2. The recognition, *by the examiner,* of the fetal movements.
3. The mapping out of the different parts of the fœtus.

The first and third of these will be considered in the chapter on the antepartum examination, as they are indispensable parts of the physical diagnosis of pregnancy. We will consider here only the second.

As already noted, the supposed perception by the patient of fetal movements is only suggestive, though it is of course highly valuable as corroborative evidence. I recall a case of spurious pregnancy in which the patient claimed to feel strong fetal movements. On examination I found that she did have powerful movements, far too powerful in fact to be produced by any fœtus; contractions of the abdominal muscles, that shook her entire body.

In seeking to feel the movements of the fœtus, the hand should be allowed to rest quietly upon the abdominal surface, not seeking to excite fetal movements, but waiting for them. They are most likely to be felt on the side opposite the dorsum as they are most often produced by the lower extremities. When thus produced, they are felt as light taps, quite unlike anything else that can be felt by abdominal palpation. Sometimes the whole body moves; the *deplacement en masse* of the French writers. In this case the heaving, twisting motion of the fetal body, clearly felt and appreciated through the abdominal wall, communicates to the examining hand a sensation at once vivid and indescribable; utterly unlike anything else in the whole realm of physical diagnosis.

The reader cannot fail to note that in the second half of pregnancy as in the first, in the positive signs as in the probable, it is practice and expertness in the physical diagnosis of pregnancy that counts for most. Mistakes are due to lack of proper training. Such mistakes are often made by men justly eminent in other departments of medicine. They are seldom made by a young man who has served six months in a maternity hospital. When the schools have learned to pay as much attention to the diagnosis of pregnancy as they now do to the diagnosis of pleurisy such mistakes will be rare indeed.

Duration of Pregnancy.—We have already seen that there is no method of determining the exact date of conception. Hence, even if the duration of pregnancy were always an exact quantity, we could not predict with absolute accuracy the date of labor.

But the duration of pregnancy is not the same in every case. This fact finds illustration in every-day practice. Many tell us, that if pregnancy is apparently prolonged two or three weeks, conception must have occurred not shortly after the last menstrual period, but just before what would have been the following one. This, however, is disproved by the fact, well known to every observant physician, that in these cases the fœtus is unusually large and well developed. Of course there are exceptions, since we know that conception may occur at any time, but this is the rule.

Ahlfeld's tables show a variation of ninety-nine days, and even when fourteen per cent. in which premature labor was surmised and six per cent. in which pregnancy was thought to be prolonged beyond the forty-first week are excluded, there remains a variation of three weeks. This seems to show, that, as I have maintained elsewhere, the duration of pregnancy is approximate, not fixed, and that there is no special day on which labor begins. It also corresponds with the observation of all physicians that mistakes of a week or two in estimating the duration of a given pregnancy, are the rule rather than the exception. This brings us to a question of practical interest.

How to Predict the Date of Labor.—Fortunately the problem is not as difficult as it might seem from the above. Age-long experience has shown that labor occurs approximately 280 days from the first day of the last menstruation, and that conception usually occurs within the first few days following menstruation.

There are several rules for computing the date of labor all based upon these facts. The following is the one that I have been in the habit of using. Add five days to the last day of the last menstruation, and count back three (calendar) months. Thus, the last day of the last menstruation was April 3rd. Adding five days, and counting back three months, we have January 8th, the day of the expected confinement. Many compute from the first day of menstruation. This is a less reliable method,

since the duration of the menstrual period varies within wide limits. Some women menstruate for two or three days, others for a week.

Whatever method is used, it is always well to inform the patient that there is no way of securing exact results and that mistakes of a week or two are common.

If one would be precise, he must make allowance for leap year, and for months that contain less than thirty-one days. Such trouble is hardly worth while, however, in a computation the results of which are at best only approximate.

Although the menstrual history affords by far the best basis for estimating the date of labor, the examiner should never forget to inquire as to the character of the last menstruation. This is especially important in cases in which the attendant circumstances lead him to believe that she is further advanced in pregnancy than she supposes or than she represents herself to be. As noted elsewhere, it is very common for a single pseudo period to occur after conception. This period usually lasts but a day or two, the discharge being slight in amount and light in color.

How to Estimate the Period of Pregnancy When the Menstrual History is Negative.—In some cases the date of the last menstruation is not known. Perhaps conception occurred in girlhood before the appearance of the menses, or during lactation when menstruation is, as a rule, in abeyance, or as happens now and then, in middle life, after menstruation had apparently ceased. In cases of this kind the estimation of the period to which pregnancy has advanced may be a matter of the greatest importance, *e.g.,* when the induction of labor is under consideration.

The symptom upon which the laity are accustomed to lay most stress is quickening. Little reliance can be placed upon this symptom. As already noted, it is usually experienced at about four and one-half months in multiparæ, a little earlier than in primiparæ. These figures are very variable, however, and the perception of fetal movements may be imagined or simulated.

On the whole, the most valuable evidence is to be found in the height of the fundus. The examiner should recall, however, that this height is subject to certain modifications. For example, in pelvic contraction the head may remain far above the brim and the fundus therefore be relatively very high, while during the "lightening" which accompanies the latter weeks of pregnancy, it sinks to the position occupied during the month before.

He should remember that it is better to determine the height of the fundus by the tape measure, than to estimate it by its relation to the umbilicus.

A method of determination introduced by Ahlfeld is based upon the length of the child. This is taken with the pelvimeter, one point of which is placed upon the head in the anterior *cul de sac,* and the other upon

the breech. The procedure is made clear by the accompanying illustration (Fig. 31).

The length of the child is perhaps the most reliable criterion of its period of development. According to Ahlfeld the length of the fœtus, as taken in the manner just indicated, represents one-half its length when the body is extended, as it would be in measuring the fœtus after delivery. In other words, one-half its real length. A mature fœtus averages fifty centimetres in length. If the measurement *in utero* is twenty-five centimetres it is probable that the fœtus is at or near term.

The descent of the fundus, which usually occurs about three weeks before delivery, the so-called "lightening" of the laity, when observed

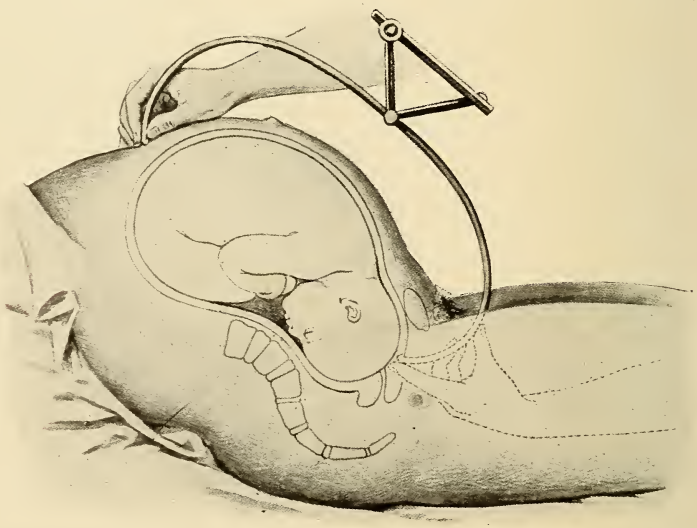


FIG. 31.—Ahlfeld's method of determining the period of development by measuring the length of child.

by a watchful and intelligent patient, is a pretty good indication that labor cannot be far away.

When in the case of a primipara who has experienced this descent of the fundus the head is found well down in the cavity of the pelvis, the cervix admits the finger, and the canal is apparently very short, or the anterior lip is obliterated, one is safe in saying that the end of pregnancy is near. Frequent urination, and some difficulty in walking, are symptoms often observed at this time.

How to Determine Whether the Fœtus is Alive.—The maternal instinct always responds gratefully to any interest shown in the welfare of the child, whether in pregnancy, labor, or the puerperium. Moreover, if the child is dead, it is better that the physician should be in a position

to inform the parents of this fact, than that they should be surprised by the unwelcome news at a later date.

Failure to hear the fetal heart sounds or to feel fetal movements is suggestive, but is never in itself positive evidence of the death of the fœtus. Cessation of fetal movements and fetal heart sounds that have once been felt and heard is, however, highly important. Other signs are diminution in the size of the uterus, which feels harder than before, and a feeling of weight in the abdomen. The fundus is not as high as previously, or at least it ceases to rise in the abdomen, as shown by measurements taken at intervals. Upon palpation a crackling sound of sinister omen is heard, the result of the movement upon each other of the bones of the cranium. The parchment-like feel and the free movement of the bones upon each other may be recognized by internal examination, if the head is within reach. A brownish-red discharge may occur. This is valuable corroborative evidence, but, by itself, may indicate only a decidual endometritis. The breasts at first become congested and secrete milk as at the termination of normal pregnancy, but later diminish in size.

Most significant of all, in my experience, is the sudden increase in force of the painless contractions of pregnancy. For example, they may suddenly become as marked in the sixth or seventh month of pregnancy as they usually are in the last week of pregnancy, or even more so. The outline of the uterus is very plain during the contractions, and the patient looks as though she were in true labor, but suffers little or no pain. Nature seems to be trying to rid the organism of a guest no longer welcome.

Certain constitutional symptoms may appear—slight chilliness, lassitude, depression. Vomiting, if it has existed, may cease, or toxæmic symptoms may abate. Nature has herself performed the cure.

The history of the case may afford a valuable clue. For example, the fœtus may have died at about the same period in one or more previous pregnancies.

The Diagnosis of Multiparity.—Has the patient been pregnant before? For medico-legal or other reasons an answer to this question may be desired. A previous pregnancy may be denied, or the patient may be unconscious or irresponsible. What are the physical signs of multiparity?

The relaxed vaginal outlet resulting from an old perineal tear will hardly escape observation, but if present may be due to traumatism other than that of labor, *e.g.,* rough or unskilled examination, or the removal of a fibrous polypus or other tumor *per vaginam.* Moreover, there are cases in which no trace of any tear can be discovered, and, very rarely, cases in which even the hymen is intact. Much more characteristic is the slit-like orifice of the cervix, with a little notch at each end marking the slight bilateral tear that is the result of almost every labor. But even this is not invariably present. Now and then one meets a case in which the cervix shows no effect of labor whatever.

In the case of a woman who has borne children, the breasts may retain

the pigment of a previous pregnancy, and they may be more relaxed and pendant than in a primipara, but these signs are not absolutely reliable.

The *striæ* upon abdomen, thighs, and breasts, white and glistening, the scars of a former pregnancy, contrasting vividly with the pinkish *striæ* of an existing pregnancy, certainly make a striking picture, but are absent in a certain number of cases, according to DeLee five to ten per cent.

Familiar changes in the figure, *e.g.*, a relaxed, prominent, or even pendulous abdomen, are common but by no means always present.

The lapse of several years serves to make the recognition of a former pregnancy more difficult, but the most difficult cases of all are those in which pregnancy occurred in girlhood, perhaps at the age of fourteen or fifteen, and five or six years have elapsed. After a Cæsarean section there may be no signs of pregnancy whatever, and the small incisions now made are hardly recognizable after a few years.

It is plain then, that there will always be a considerable proportion of cases in which absolute certainty is not attainable, and a few in which there is practically no evidence at all.

Nevertheless, there is usually no great difficulty in the matter. While none of the signs mentioned above are infallible, if two or three of them are present, the presumption of previous pregnancy is very strong. Of all the evidences the relaxed vaginal outlet with the remains of a perineal tear, and the transverse slit in the cervix, are the most significant. When with these we find the *striæ* of a previous pregnancy, the circumstantial evidence is sufficient for conviction.

The Diagnosis of Sex.—The attempt to diagnose the sex of the fœtus has hitherto been unsuccessful. There are, however, certain aids to a presumptive diagnosis that are of theoretical, rather than practical, interest.

In the first place, it is said that the fetal heart beats faster in girls than in boys.

In the second place, it is certain that the average size and weight of boys exceeds that of girls, though of course there are many exceptions to this rule. Moreover, it is difficult to estimate accurately the size of the child.

Finally, certain writers teach that elderly primiparæ give birth to boys oftener than to girls.

Taking all these factors together one may make a "good guess" in a given case; but he is wise who reserves his decision until after delivery.

The Serodiagnosis of Pregnancy.—As might have been expected, the new biologic theories have not been without effect upon the question of the diagnosis of pregnancy. Thus far, however, the results have been of theoretical rather than practical interest. Of the various tests of this kind the best known is that of Abderhalden and is based upon the fact that during pregnancy a foreign albumen gets into the blood through the medium of placental villi that are broken off and enter the general circu-

lation and that, for the reduction of these elements, protective ferments are formed, the discovery of which constitutes a proof of pregnancy.

All this appears easy on paper, but the laboratory technic is difficult and the results of different experts conflicting. The characteristic reaction may be found in other conditions and it appears, therefore, that for the present at least the test is of positive rather than negative value. For the sake of fairness, however, it must be admitted that Abderhalden and his followers claim that unsatisfactory results are due to defective technic.

Thus it is plain that now as before the practitioner must be dependent for the most part at least upon the history and circumstances of the case and especially upon the results of physical examination. After all, the latter will seldom leave him in the lurch. The great essential is long and persevering practice of the methods we have already studied.

The Differential Diagnosis of Pregnancy.—With the slight attention so often given to the physical diagnosis of pregnancy, it is not strange that the pregnant uterus has been confounded with tumors, and *vice versa*. Such mistakes are not as common as they were before the department of obstetrics became recognized as one of the most important departments of the medical curriculum.

The methods of differentiating between pregnancy and fibroid, ovarian, or other tumors, will be discussed in connection with the pathology of pregnancy.

Perhaps the most common difficulty with which the practitioner is confronted is the distinction between subinvolution and early pregnancy. In subinvolution the uterus is still considerably larger than normal, and still retains something of the softness and boggy consistence of pregnancy. To add to the difficulty, menstruation is often absent as a result of lactation anæmia, and the general condition and appearance of the patient resembles that of early pregnancy.

In these cases, however, there will usually be the history of backache and profuse vaginal discharge, following the puerperium. Retroflexion is common, whereas in pregnancy it is exceptional. The uterus is often tender on pressure. The patient's sufferings are much aggravated.

Chronic metritis has been mistaken for pregnancy, but this mistake should not be made by a competent examiner. In this condition the uterus is enlarged, but is harder than in pregnancy, and Hegar's sign and all the other signs based upon the softening of the lower uterine segment are absent. Moreover, there is a history of previous uterine disease, and an absence of the presumptive symptoms of pregnancy, cessation of menstruation, nausea, changes in the breasts, etc.

In supravaginal hypertrophy of the uterus the unusual length and size of the cervix has sometimes caused it to be mistaken for the pregnant uterus. If the finger is carried high enough, however, the body of the uterus may be felt.

In ascites some cardiac, hepatic, or renal cause will be found. The

position of the fluid changes with the position of the patient. For example, if the patient stands or sits, the fluid settles to the lower part of the abdomen. Moreover, vaginal examination is negative.

To consider every condition that might possibly be mistaken for pregnancy by the careless or incompetent would carry us too far. There is one condition, however, which every physician is likely to meet sooner or later, and which he should on no account forget to study. I refer to spurious pregnancy.

Pseudocyesis or Spurious Pregnancy.—Recalling the part played by the maternal instinct in the life of woman, we need not wonder that in the study and in the diagnosis of pregnancy, the influence of suggestion must be taken into account.

FIG. 32.—Hysterical tympanites.

Spurious pregnancy, or phantom pregnancy, is not very uncommon, especially in patients who frequent the clinics of our large cities, where all races and types are represented.

Naturally enough it is most common in those whose eager desire for maternity has not, and is not likely to be gratified. Thus it is most often encountered at the time of the menopause, or in the case of patients who have been long married but who have never conceived.

Next to the element of desire comes the element of fear, and we occasionally find the symptoms of pregnancy imagined by those who have been exposed to the possibility of an illegitimate pregnancy.

In certain cases the belief is not a result of suggestion, but a symptom

of true insanity. In other words, it is a delusion. This of course is quite a different matter.

It is literally true that suggestion can in these cases "work wonders." All the presumptive symptoms of pregnancy can be evoked or accurately counterfeited under the influence of this mysterious power. Menstruation may cease, morning sickness may appear, the breasts increase in size, the abdomen may become distended and fetal movements may be simulated by movements of gas in the bowel, or by contractions of the abdominal muscles (Figs. 32 and 33). The statements of the patient cannot be

FIG. 33.—The same patient when anæsthetized.

trusted, though she may be perfectly honest, and may sincerely believe that she is telling the truth.

He who depends upon text-books and lectures alone will never be able to solve the problem, but will be in the humiliating position of being obliged to wait until weeks or perhaps months have solved the question for him; but he who is familiar with the results of the bimanual examination of early pregnancy need have no trouble, except possibly, in the first few weeks. If, for example, the patient states that she feels fetal movements, or that she has not menstruated for three or four months, and examination discloses the small, hard uterus of the non-pregnant condition, the question is settled. If the patient gives a history of an eight

months' pregnancy, but no fetal parts can be recognized, no heart sounds heard, pregnancy does not exist. In other words, a competent examiner is to determine whether there are evidences in the uterus of changes corresponding to the alleged date of pregnancy.

Trouble may arise if the patient is so stout as to make satisfactory external or bimanual examination impossible. Here, in early pregnancy, a recto-vaginal examination, under anæsthesia if necessary, will solve the problem. Grasping the thick abdominal wall and moving it upon the structures beneath, may be sufficient to disprove the assertion of advanced pregnancy. In case of distention by gas, the latter disappears under anæsthesia, external, or bimanual examination becomes easy, and difficulties vanish.

I have said that no reliance can be placed upon the statements of the patient. One thing, however, is to be remembered. If cross-examined she will often place the date of some important symptom, *e.g.,* quickening, or the cessation of menstruation, so far back, perhaps ten or twelve months, that the hypothesis of pregnancy is at once seen to be untenable.

Superfecundation and Superfetation.—Before leaving this subject brief mention must be made of two matters occupying the borderland of fable, and yet, perhaps for that very reason, possessing a certain fascination for every student of obstetrics. I refer to superfecundation and superfetation.

Superfecundation.—By this is meant conception in a woman already impregnated. For example, if a negro woman gives birth to twins, one of which is white and the other a mulatto, we may know that she has had intercourse with a white man. There is, however, no way of proving that she has had intercourse with a negro. The mulatto child may be simply the usual result of intercourse between a white and a black, while the white child may have failed to inherit any of the physical traits of its black mother, as is often the case.

Superfecundation has been proven in the case of the lower animals, and there is apparently no physiological reason why it should not occur in man. Naturally it is difficult of proof. Williams reports the case of a woman who within a brief period had intercourse with two men one of whom had syphilis. She was delivered of twins, one of which was still-born, and showed placental and fetal evidences of syphilis.

Schultze believes that superfecundation could only be absolutely proven by demonstrating the crossing of three races, *e.g.,* by a negro woman giving birth to twins, one showing Caucasian, the other Mongolian descent.

Superfetation.—By this term is meant a second conception occurring weeks or even months after the first, and resulting in the development and growth of a second fœtus. Doubtless the idea of superfetation had its origin in the fact that, as we shall see in the chapter on multiple pregnancy, twins often represent different stages of development.

Superfetation is hardly possible after the fourth month, since at that time the decidua reflexa and the decidua vera become united, and the entrance of spermatozoa is mechanically prevented.

It is hardly likely to occur before that time because ovulation usually ceases during pregnancy. Moreover, as Bumm aptly observes, it has not been noted in cases of uterus duplex in which there would seem to be every facility for its occurrence were such occurrence possible. There have been, however, distinguished advocates of the possibility of superfetation. The great Tarnier believed that he had observed cases.

CHAPTER III

THE MANAGEMENT OF PREGNANCY

Management

The term management of pregnancy is not to be understood as implying that normal pregnancy needs to be "managed" in the sense that we manage a pathological process. It is better to disabuse the mind of that impression at the outset; the mind of the patient, as well as that of the physician. The patient should be told that she is not sick, that pregnancy, indeed, is the highest kind of health, and that she does not necessarily need any special regimen or any medicine.

It is unfortunately true, however, that the pregnant woman is exposed to certain dangers that do not menace her non-pregnant sister, and that pregnancy too often occupies the borderland between health and disease. There are certain things to be avoided, certain danger signals for which one should watch.

Pregnancy then does not necessarily need active interference, but it does need competent medical supervision. Before the rise of modern scientific obstetrics, the physician had but one interview with his patient before he saw her in labor. At this interview he sought to compute the expected day of confinement, and, perhaps, to arrange the matter of the fee. When next he saw her, she might be in the throes of an eclamptic convulsion, or striving vainly to overcome the resistance offered by a contracted pelvis.

It is unfortunately true that this custom, worthy of the days when the lying-in chamber was ruled by the midwife and the monthly nurse, is still all too common. It is, however, from every aspect, a bad one. Even the laity are now sufficiently well informed in medicine to know that it is absolutely without justification. Those physicians, if there are any such, who are governed only by selfish motives, should not forget this.

The patient should be under the care of her physician during the entire period of her pregnancy. She should report to him at intervals of three or four weeks during the earlier months of pregnancy, and somewhat oftener during the last two months. She is fortunate if she has some judicious friend or relative of her own sex, a mother or married sister perhaps, in whom she can confide as occasion or inclination demands, not so much for instruction as for comfort, but with this exception she should discuss her case only with her physician. It is the experience of every practitioner that the prospective mothers among his patients are annoyed, and sometimes driven to the verge of hysteria, by the gossip of injudicious friends who not only give all kinds of advice, mostly bad, but relate cases of operations ending fatally, etc.

There is, at the present time, a very prevalent tendency to regard obstetrics as a purely surgical specialty. This tendency should be discouraged. He who begins by studying the general health of his patient, examines her heart and lungs, learns her history and family tendencies, and is thus able to estimate her powers of resistance, and to stand guard at threatened points, will in the end make a better surgeon than he who is a mere mechanic. It is perfectly true that the obstetrician should have a good surgical training, but it is also true that he should have a good medical training, and that he should have been engaged for some years in the general practice of medicine.

For example, it is highly important to discover nephritis or incipient tuberculosis early in pregnancy, when treatment may be of some avail. Neglect in this respect is sure to be avenged sooner or later.

Special attention should be given to the anæmia and malnutrition so common in early pregnancy. These symptoms, combined as they often are with constipation and some exaggeration of the nausea and vomiting common at that time, are too often taken as a matter of course. Their neglect, however, may be a cause of serious trouble later. That they ever should be neglected is unfortunate, for they are very amenable to treatment by suggestion, diet, fresh air, oxygen, chalybeate tonics, etc.

During the entire course of pregnancy the physician should remember that intercurrent and complicating diseases, while not common, do sometimes occur, and that not everything that happens at this time is necessarily a complication of pregnancy *per se*.

In a general way the matters that should engage the attention of the physician may be summarized as follows:

1. The general physical condition of the patient.

2. The hygiene of pregnancy proper, including such matters as diet, dress, bathing, exercise, etc.

3. Attention to certain matters of prophylaxis. This is perhaps the most important of all. Prophylaxis is the key to the management of pregnancy. Illustrations of this are to be found in the prevention of eclampsia by the prompt recognition and treatment of the toxæmia of pregnancy, the recognition of discovery of pelvic contraction or other anomaly at the antepartum examination, the prevention of abortion by suitable precautions, etc.

The General Health of the Patient

When the physician sees his patient for the first time early in pregnancy, *his first duty* is to inform himself as to her general health, and especially as to the condition of her heart, lungs and kidneys. The knowledge gained in this way is far more important than anything that is usually discovered at this time by vaginal examination.

As we shall see later, regular examinations of the urine should be made from the beginning. I emphasize this here, at the risk of being

accused of repetition, because I believe that there are some things that should be so fixed in the mind of the man who would practise obstetrics, that he cannot forget them if he will.

General Mode of Life.—Taking up now what I have ventured to call the hygiene of pregnancy, let us return to the proposition that pregnancy is not a disease, and that it does not necessarily require active treatment. From this it follows that the patient need not make any radical change in her method of living. Indeed, it is probably better that she should not import into her life at this time any new and untried elements. An exception to this rule, however, is to be found in the case of certain patients of the neurotic type, and in the neurotic type of the vomiting of pregnancy. Here a complete change of air, scene and habit may work wonders.

Diet.—The pregnant woman needs no special system of diet. What she does need, is a mixed diet of plain and nutritious food, of good quality and sufficient quantity. In view of the increased demands upon the eliminative organs, it is perhaps well to limit red meat to one meal a day, and to substitute fish or fowl for meat two or three times a week. It is also well for the patient to drink plenty of water, and to eat a good deal of fruit, thus favoring elimination and combating the tendency to constipation so common during pregnancy. Recalling the great demand for lime salts at this time, and the disastrous effect of their limitation, it seems plain that they should be plentifully supplied in the diet. Bread from the whole wheat is to be preferred to bread made from ordinary white flour, and its sustaining effect is always appreciated by the patient. The baker's bread sold in our large cities contains little nourishment. Articles that are known to disagree with the patient should be sedulously avoided. An attack of acute indigestion during pregnancy may prove a serious matter and abortion may result. Sweets and desserts are to be taken with moderation. Alcoholics are to be avoided unless specially indicated.

As regards the frequency of meals and the amount of food to be taken, the appetite of the patient is, within reasonable limits, the best guide. It is folly to refuse sufficient nourishment to a woman who must provide not only for her own necessities, but for those of her living and growing child. A great deal of good may be done by allowing the patient a light meal just before retiring, or in the middle of the night, if she feels the need of it. Sleeplessness and nervousness in pregnant women are often due to an empty stomach. Starvation as a preparation for labor and lactation is certainly irrational. Schemes of reduction advocated in books written for the laity are to be regarded with suspicion. If fear of toxæmia or kidney complication exists the patient may at least have plenty of milk, which is not only a good food but a good diuretic as well; but one should remember and guard against the constipating effect of an exclusive milk diet.

Special diet may, of course, be necessary for special conditions, *e.g.*, in toxæmia, and in diabetes, and Prochownik has advised a special diet for

certain cases of pelvic contraction. Each of these will be discussed in its appropriate place.

Exercise.—Barring complications, a reasonable amount of out-of-door exercise is as necessary during pregnancy as at any time, perhaps more so. On the whole, walking in the fresh air is the best. It should not, however, be carried to the point of fatigue. It may and should be continued up to the very onset of labor, and is especially useful in primiparæ, promoting the descent and engagement of the head, and the expansion of the lower uterine segment. If the patient is easily fatigued the walks should be short, with intervals of rest.

Long standing, however, should be absolutely forbidden, since it unquestionably tends to promote the development of varicosities, or the increase of those already existing. In rare cases it may cause the rupture of a varicosity with profuse and dangerous hemorrhage.

If there is no special contra-indication the patient may busy herself with light housework. Indeed it is far better that she should be thus occupied than that she should sit idly by in morbid preoccupation. Here also, however, overexertion and long standing should be avoided. She should never attempt to lift heavy objects, or move heavy articles of furniture, especially in the latter months of pregnancy. Such imprudences may result in premature rupture of the membranes. There is a popular tradition that a patient should not reach up after high objects. All unusual or violent exercises should be tabooed. Bicycling, tennis, horseback riding, or carriage riding over rough roads, long railroad or trolley car journeys and the like, should be forbidden. It is true that these things do not always result badly, but they are not necessary to the health of the patient, and they always involve the risk of abortion. On the other hand, automobiling over smooth roads for periods not too long is often beneficial.

For those who for some reason must remain in-doors, or even in bed, passive resistance movements and massage aid materially in promoting the general nutrition.

Fresh Air and Oxygen.—The pregnant woman should have an abundant and constant supply of fresh air. She should spend as much time as possible out-of-doors and her bedroom should be well ventilated. When she cannot go out or will not leave the house, she can rest or sleep upon an open veranda during the day, or even at night. She should avoid all ill-ventilated rooms and all crowded places. I believe that the occasional inhalation of oxygen is highly beneficial even in cases approximately normal. Slight subjective dyspnœa is very common during pregnancy, and both theoretical and practical considerations indicate the need of oxygen in one form or another. My own views upon this subject will be found in the chapter on the toxæmia of pregnancy. Suffice it to say here, that I believe that what I may call the out-door management of

pregnancy will some day be recognized as the most important factor in the care of patients during this period.

Sleep.—It is highly important that the pregnant woman should have an abundant supply of sleep and if, as frequently happens, her sleep is disturbed at night, she should make up for this by sleeping in the daytime: in an airy chamber, or still better, out-of-doors. If inclined to doze in the morning she should not be disturbed. With many women it is the nervous system that suffers most during pregnancy. Nervousness and despondency are always exaggerated by loss of sleep and its effect in this respect is even more marked in pregnancy than at other times.

Bowels.—Constipation is so common during pregnancy, that one is tempted to think of it as an incident, rather than a complication. Mild cases may be treated by laxative articles of diet and by drinking a glass of water before breakfast. Of medicines, the best in my experience is cascara, in one form or another, given every day or every other day for a time. The result of the first dose is often unsatisfactory, and the patient should be informed of this in advance. Thirty to sixty drops of the fluid extract, or three to five grains of the solid extract, may be given at bedtime. The size of the dose, and the frequency of its administration, must be determined by experiment. When the proper medium has been reached, however, this drug will be found very satisfactory. It produces natural movements, does not deplete the patient as do the salines, and, above all, has no tendency to produce abortion or premature labor. When an immediate movement is desired we may begin with the effervescent citrate of magnesia, which is mild, pleasant to take, and usually efficient.

The stronger salines which produce copious watery movements should be reserved for cases in which they are distinctly indicated, *e.g.*, certain cases of toxæmia. Depleting measures are usually contra-indicated in pregnancy, and especially in early pregnancy. Pregnant women are often advised by their friends to take "salts," but the practice is a bad one.

Castor oil should never be given during pregnancy unless the induction of labor is contemplated. In the later months, a single dose of this drug is often sufficient to produce this effect. I have found that this important fact, so familiar to the monthly nurse, is unknown to many physicians, and even to some writers on materia medica.

Sexual Intercourse.—It is perhaps impracticable to prevent sexual intercourse during the entire period of pregnancy, but it should be practised, if at all, with great moderation and restraint. It may result in the interruption of pregnancy if the patient is predisposed to abortion. In the latter weeks it should be avoided altogether, since it may be the cause of infection. I recall one case of placenta prævia, previously unsuspected, in which a fatal hemorrhage was the immediate result of sexual intercourse.

Clothing.—All clothing should be loose and comfortable. The ordinary corset should not be worn after the uterus can be felt above the symphysis; *i.e.*, after the third month. Tight corsets impede respiration

and interfere with the pelvic circulation. In the later months of pregnancy, however, if the abdomen is pendulous or prominent, or if the patient complains of the weight of the uterine contents, an abdominal supporter may afford great comfort, and perhaps prevent diastasis of the recti muscles. The weight of skirts should be suspended from the shoulders, not from the waist. Circular garters should be avoided, as tending to cause varicosities or to aggravate them if present.

Sufficient clothing to prevent chilling should be worn, but there is no necessity for the overdressing sometimes recommended. Undercloth-ing should be of some porous cotton or linen mesh material which provides for elimination by the skin, and is thus far superior to the old-fashioned all-wool garments.

Bathing.—This is obviously important during pregnancy, not only because it favors elimination, but also as a tonic and general invigorator, and stimulant of metabolism. The genitalia should be washed daily with soap and water during the latter weeks of pregnancy, but no douches should be taken without the express order of the physician. In normal cases they are quite unnecessary, and are, in themselves, likely to cause infection. Scrupulous external cleanliness, however, is of undoubted value as a preventive of infection, especially of infection by the colon bacillus. This statement applies not only to infection during labor, but also to those cases of infection that are occasionally noted during pregnancy, and particularly to pyelitis.

Care of the Nipples.—The application of solutions of alcohol, tannic acid, and other astringents, to the nipples, for the purpose of hardening them, and thus preventing the development of erosions and fissures, is widely practised. A nipple that is soft and supple is less likely to become cracked than one that has been artificially hardened, if indeed the latter is possible. Nor do I believe that benefit is derived from keeping the nipple smeared with ointments and salves that are seldom sterile, or, if they are, cannot long remain so.

I agree with the late Dr. Tucker, of the Sloane Maternity Hospital, that simple cleanliness, *i.e.*, washing the nipples daily with soap and water, is all that is necessary. This serves to remove the crusts that otherwise gather and that predispose to erosions. All pressure from corsets and other clothing should be carefully avoided, and the nipples should be freely exposed to the open air whenever circumstances permit.

If the nipples are not sufficiently prominent, they should be drawn out daily during the latter weeks either by the fingers or breast pump. The latter is the more effectual.

Let me here emphasize the fact that much more depends upon the proper treatment of the nipples during the first few days of the puer-perium, than upon any special treatment employed during pregnancy. This important subject will be discussed in connection with the management of the puerperium.

The Teeth.—For every child a tooth. So runs the ancient legend—a legend founded upon fact. We have already seen that the maternal organism must supply calcium for the fœtus. This the mother can often ill afford to spare. The teeth should be regularly and carefully brushed, and some preparation which is both alkaline and antiseptic, *e.g.,* alkalol, used as a mouth wash. The diet should be rich in phosphates, such articles as oatmeal and whole wheat bread being furnished in abundance. The syrup of lactophosphate of lime, or some similar preparation, is indicated. Good dental advice should be obtained. If the patient is not extremely nervous or sensitive, manipulations that are not prolonged or painful, *e.g.,* the insertion of temporary fillings, are not contra-indicated. Procedures attended by severe pain are better postponed if practicable.

Examination of the Urine.—Regular examinations of the urine should never be neglected. Such examinations should be made every two or three weeks during the first six months, and during the last three months when toxæmia and eclampsia are most likely to develop, every week. The neglect of these examinations is highly reprehensible, and may result in disaster to the patient, and deserved criticism of the physician. The latter should not be satisfied with the chemical examination, but should invariably inquire as to the quantity passed. Many men forget all about this, but it is obvious that a considerable diminution in the total quantity of urine is a much more serious matter than any ordinary change in its composition. Whenever there is any doubt, the quantity passed in twenty-four hours should be measured. This subject will be considered again in connection with the toxæmia of pregnancy.

When practicable, the examination of the urine should be accompanied by measurement of the blood-pressure. It is true that marked oscillations in the blood-pressure may occur during pregnancy without appreciable disturbance, but the procedure is nevertheless a wise one as affording valuable corroborative evidence.

Mental Hygiene.—Last, but by no means least, I would place the psychical treatment, or, as I have been accustomed to call it, the mental hygiene of pregnancy.

As noted in the last chapter, there are some women who feel better during pregnancy than at any other time. These cases, however, are exceptional. The majority of patients are, to a greater or less extent, psychically depressed during the early months of pregnancy. While there is no actual ground for this depression, as the patient will herself usually admit, it is nevertheless a very real thing to her.

This condition calls for the greatest forbearance and consideration. The patient should be informed that her condition is the result of the physical disability incident to early pregnancy, that many other women are affected in precisely the same way, and that a change for the better is sure to follow. Her husband and family should be informed that nervousness and irritability, if present, are the result of her physical

condition, and are on no account to be met with argument and attempts at repression. Every reasonable desire should be granted, and every unreasonable one, the fulfillment of which will do no great harm. Any harmless amusement or diversion may prove beneficial. If these methods do not succeed, change of air or scene may be found the one thing needful.

Prophylaxis.—In the management of pregnancy, prophylaxis is of prime importance. For example, eclampsia, the most formidable complication in obstetrics, may almost always, if not always, be prevented by the timely recognition and treatment of the symptoms of toxæmia.

Placenta prævia, another and a justly dreaded complication, need hardly ever result fatally, if the patient is properly watched during pregnancy. Hence the importance of instructing the patient to report any loss of blood, especially if it be painless. A slight hemorrhage is often regarded as of no great consequence, provided it is not accompanied by pain, but, we shall see when we come to the study of placenta prævia, painless hemorrhage is always of serious import.

Hemorrhage accompanied by severe pain usually indicates impending or actual abortion, a much less dangerous condition but one which brings an urgent call for medical aid. And with reference to abortion, this unfortunate ending of pregnancy may often be prevented.

If pregnancy be complicated by gonorrhœa, it is of the utmost importance that the attendant be aware of this fact, since, as we shall see later, there is much that can be done in these cases, not only to make labor safer for the mother, but also to prevent infection of the child's eyes.

In view of the frequent need of catheterization in the first few days following delivery, and the harm occasionally resulting from this, it is well to advise the patient that she should become accustomed to urinating in the recumbent position during the latter days of pregnancy.

And so one might go on, if space permitted. These examples, however, will suffice to suggest to the reader the need of independent study in this direction.

I have already emphasized the importance, from the standpoint of prophylaxis, of becoming acquainted as early as possible with the history and general physical condition of the patient. The importance of an examination, at some time during the last few weeks of pregnancy, cannot be overestimated. Its prophylactic value is often far greater than that of an examination during labor and its neglect a most serious defect in obstetric practice. Worthy of note in this connection is the suggestion that the same precautions against infection be taken as during labor.

It is true that the internal examination at this time involves the least danger but in many cases labor may be already in progress, its onset not having been recognized, and consequently a serious or fatal result is possible. From the beginning of cervical dilatation we have a surface favorable to the direct absorption of septic matter.

Following out this line of thought, it becomes evident that since the

physician cannot be with his patient all the time, he should inform her of those danger signals which he, if present, would not neglect. I am accustomed to instruct my patient to report to me any change in her condition, or any unusual symptoms, especially the following: diminution in the quantity of urine, increased vaginal discharge or any gush of fluid, bleeding from the vagina however slight, headache, dimness of vision or spots before the eyes, swelling of the feet or face, any nausea or vomiting after the cessation of the usual morning sickness, epigastric or abdominal pain, obstinate constipation, etc. In some cases it may be better not to annoy the patient with these directions, but to give them to some responsible member of her family, or to the nurse if there be one in attendance.

Experience has taught me that it is never safe to wait until notified by the patient of the existence of some of these symptoms. To do this is, in some cases, to wait too long. Some of the most dangerous symptoms, *e.g.,* swelling of the face, and the early hemorrhages of placenta prævia, are not productive of pain or discomfort, and are often overlooked. As stated above, the patient should be seen at intervals, and at these interviews the attendant should satisfy himself, by careful questioning, and, so far as practicable, by actual examination, that threatening symptoms are not present.

All this takes but little time, and may be productive of untold good. Its main object of course is to forestall complications, but it also serves to reassure the patient, who soon learns that her physician is really interested in her welfare. It tends to establish the reputation of the physician as a careful man who uses modern methods, and, what is more important, it enables him to feel that he has not been unworthy of the responsibility committed to him.

CHAPTER IV

THE ANTEPARTUM EXAMINATION

As indicated in the previous chapter, the physician should make it his first duty to become familiar with the history and general physical condition of his patient. But this is by no means all. Every man who assumes the responsibility of caring for a woman in labor, should inform himself, before labor begins, as to whether there is anything in the condition of mother or child that may delay or complicate the process. This can only be done by actual examination. The prophylactic value of such an examination is very great. For example, the patient may be the subject of pelvic contraction sufficient to cause serious dystocia, and yet she may present no noticeable deformity whatever. If the condition is recognized in time, premature labor may be induced, or arrangements made to operate early in labor, before exhaustion or possible infection make the Cæsarean section more than usually hazardous.

Various other conditions—malpositions and malpresentations, unusual size of the fœtus, placenta prævia, tumors that may obstruct delivery, venereal diseases with the accompanying danger of maternal infection and fetal ophthalmia, and many other conditions which need not be enumerated here, but which are all amenable to curative treatment.

This examination has become known in hospital parlance as the antepartum examination, and as such deserves separate and careful consideration. Its importance is twofold. It safeguards the patient against many dangers, and it familiarizes the physician with the external diagnosis of position and presentation, a subject of vast importance, which can be much better studied at this time than during labor, when the patient is sensitive to all manipulations, and the retraction and thickening of the uterine wall, especially after rupture of the membranes and escape of the liquor amnii, makes examination difficult.

He who intends to do much obstetrical work should embrace every opportunity of perfecting himself in this method of examination. With continued practice, he will be astonished to learn how much can be accomplished. Moreover, while it is best learned during the latter weeks of pregnancy, it can usually be practised during labor, between contractions.

Another important advantage gained by this examination is, that it often makes an examination early in labor quite superfluous, thus lessening the danger of infection and making immediate examination at the time of labor unnecessary. For example, if in the case of a primipara the antepartum examination has shown that there is no contraction of the pelvis, that the head is in the pelvic cavity, and that everything else is as it should be, and if the patient is attended by a good nurse, who reports

that the "pains" resemble in character and frequency those of the first stage, there is obviously no great occasion for haste, and no great necessity for internal manipulations.

To my mind, the importance of this work is underestimated by students and teachers alike. How much time is spent in the study of the physical diagnosis of cardiac and respiratory diseases in the adult, often indeed when the matter is of academic interest only, and how little in the study of the physical diagnosis of pregnancy, a subject of far greater practical importance.

When should this examination be made? Preferably, from two to four weeks after the period of viability of the child has been reached, *i.e.*, when the patient is from seven and one-half to eight months pregnant. At this time it is not too late for the induction of labor, should this be found advisable. If the pelvis is measured at this time, further examination will not be necessary, unless some complication is discovered. An external examination, however, a week or two before the expected date of labor, is highly desirable. At this time, the fetal outlines are much more easily made out, and the position and presentation accurately determined. Moreover, in the case of a primipara, it is important to determine whether the head has entered the cavity of the pelvis.

Technic.—The patient should be in the dorsal position, upon a firm mattress, or preferably, a table. In order that the greatest relaxation of the abdominal muscles may be secured, the knees should be moderately flexed, and the head and shoulders slightly raised. It is desirable that the bladder and bowels be empty. Table or mattress should be of convenient height. If the examiner is obliged to stoop, his movements will be constrained and he will be more liable to error. Moreover, in feeling the promontory of the sacrum it is often necessary to sink the elbow almost perpendicularly, and this is impossible, or at least very difficult, when the patient is near the level of the floor. Corsets should be removed and clothing so arranged that the abdomen can be exposed from the xiphoid to the symphysis. The object of the procedure should be explained to the patient, who may usually be truthfully told that it will be attended by little or no pain.

Inspection.—The practiced eye takes note of many things. Unusual size of the abdomen suggests contracted pelvis, hydramnion, twin pregnancy, or a very large fœtus. Great prominence of the abdomen in a primipara reminds one of contracted pelvis, as does also a pendulous abdomen in a multipara. In transverse positions the fact that the long axis of the uterus is transverse is often apparent to the eye. Fetal movements may often be seen through the abdominal wall. Operative scars should not escape attention.

Palpation.—It is best, especially for the beginner, to preserve a definite order. This conduces to systematic and careful work. The external examination *should always precede the internal.* The latter

supplements and confirms the former. As a rule, the external examination affords more information than the internal, and in many cases it makes the latter quite unnecessary, *e.g.,* if in the case of a primipara

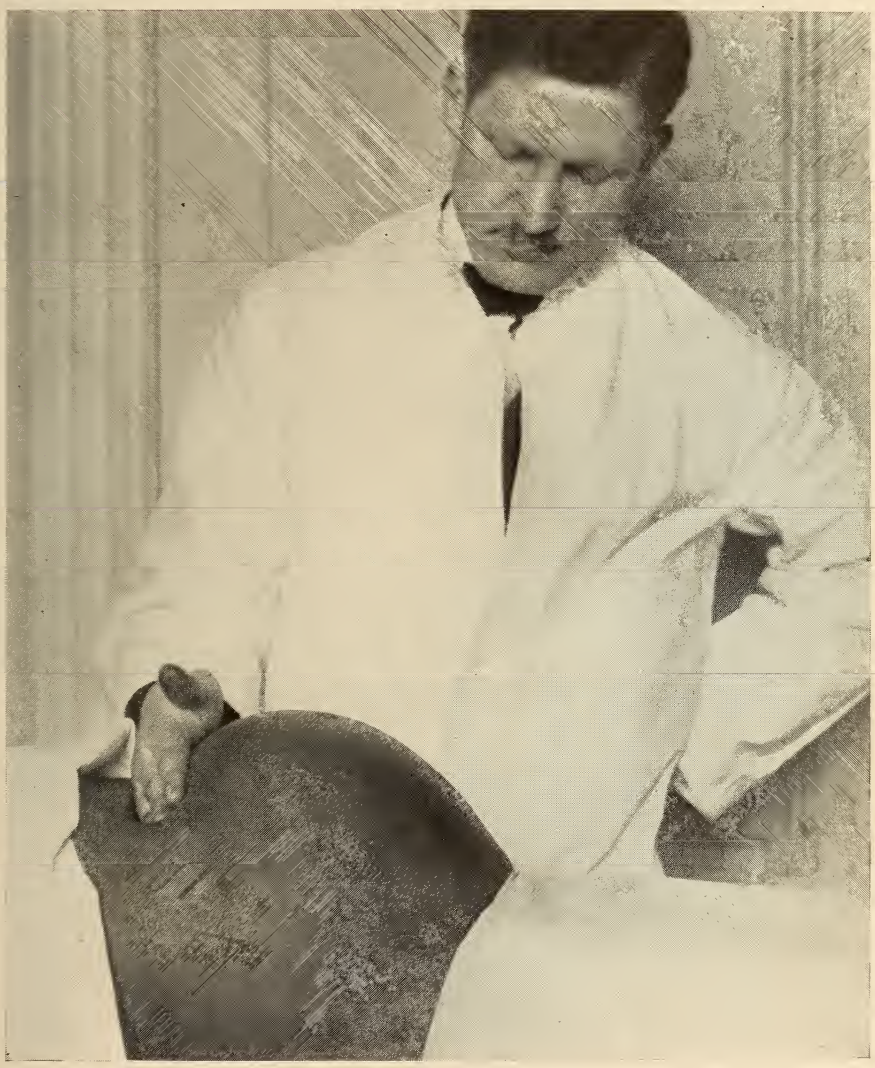


FIG. 34.—Outlining the fundus.

the head is found well down in the cavity of the pelvis, and the measurements of the pelvic outlet are normal, it is quite unnecessary to subject the patient to the ordeal of a careful internal pelvimetry. Likewise, in

FIG. 35. —Usual method of palpating the abdomen. The palms of hands are used.

FIG. 36.—A better method. The finger tips are used.

the case of a multipara, if the external examination discloses normal conditions, and the patient gives a reliable history of easy deliveries, one may dispense with the internal examination.

All manipulations should be gentle. The great mistake of the beginner, and sometimes of those who should know better, is to make strong pressure, which is annoying or even painful, and which the patient involuntarily resists. *Use the tips of the fingers* and not the flat of the hand.

It is best to begin by outlining the fundus (Fig. 34). This is done,

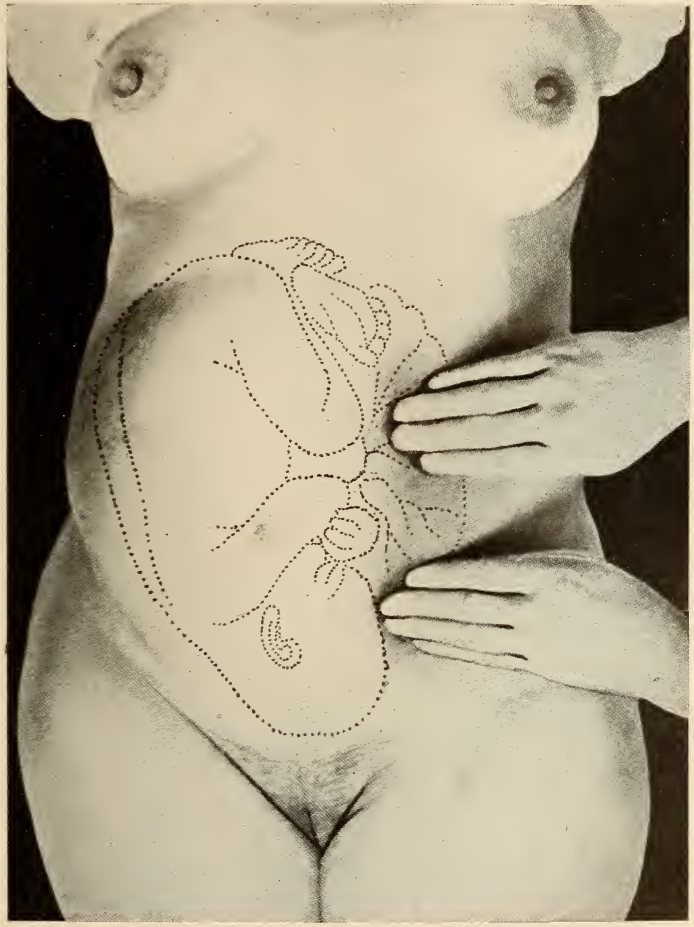


FIG. 37.—Vertex presentation; palpation of the small parts.

not, as is so often supposed, to map out the breech, but to determine the height of the fundus, and thus to be able to estimate the probable period of pregnancy. The breech has no characteristic outline, and is best located by determining the position of the head. If the examiner knows the position of the head, he should have little difficulty in determining that of the breech. As we have already seen, the uterus is usually in a position

of right obliquity. It is well to correct this by gently carrying the fundus to the median line. After this has been done it is often observed that the fundus is really higher, and pregnancy probably farther advanced than was previously supposed.

The Fetal Back.—The next thing to do, is to determine the long axis of the fœtus, thus making sure that we are not overlooking a trans-

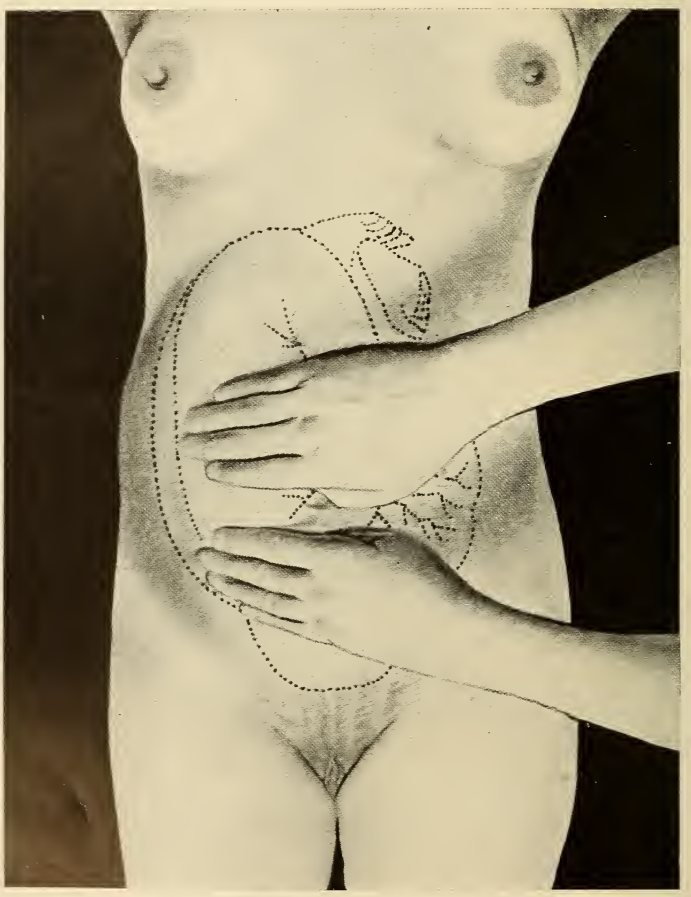


Fig. 38.—Vertex presentation; palpation of the back.

verse position. This is not usually necessary, the contour of the abdomen being sufficiently plain to the experienced eye, but it is always a wise precaution for the beginner.

It is now in order to locate the back of the fœtus. This is recognized as a broad resistant surface immediately beneath the abdominal wall, and extending over a large part of one lateral half of the abdominal area. It is best appreciated by using only the pulps of the finger-tips and applying

these very gently (Figs. 34, 35, 36, 37 and 38). One often sees most unskilful manipulations, prodding with the fingers, pushing with the palm of the hand, etc. After a little practice with the correct method, one need have no trouble at all, unless the abdominal wall is very thick.

On the side opposite the back, the characteristic resistance will be

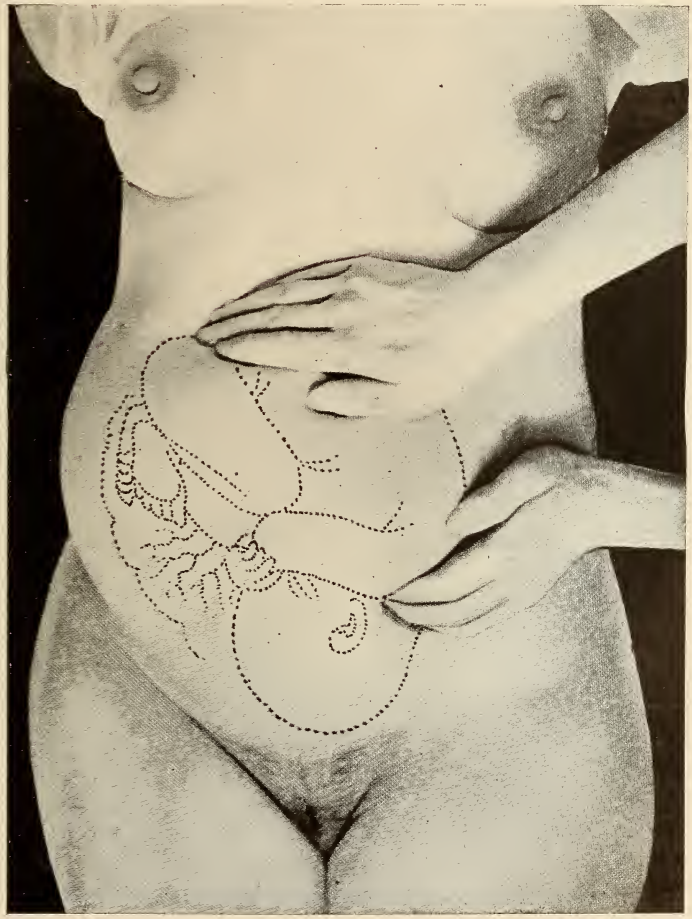


FIG. 39.—Palpating the shoulder in vertex presentation.

absent. Indeed the best way for the beginner to learn how to recognize the back is to palpate the abdomen, first on one side then on the other. In this way he cannot fail to appreciate and remember the sensation conveyed to the palpating fingers. Not only is the abdomen softer on the side opposite the back, but fetal parts may usually be felt. This is not always the case, however, nor is their presence necessary to the diagnosis. The student soon becomes familiar with these "small parts,"

as small, irregular, and moving protuberances which can be not only felt, but seen to move, through the abdominal wall, especially if the latter is thin. As we shall see later, their presence in front, near the median line, is evidence of a posterior position of the occiput.

The palpation of the fetal back is of great importance. It tells whether the occiput points to the right or left, anteriorly or posteriorly, earlier and better than this can be determined by vaginal examination; long, indeed, before the beginning of labor. It also tells us where to look for the fetal shoulder, and where to listen for the fetal heart. Conversely, of course, the fetal heart, of which we shall speak presently, helps to locate the back and shoulder. In left positions of the occiput, the back is on the mother's left side, and in right positions, on the right. In posterior positions, it is

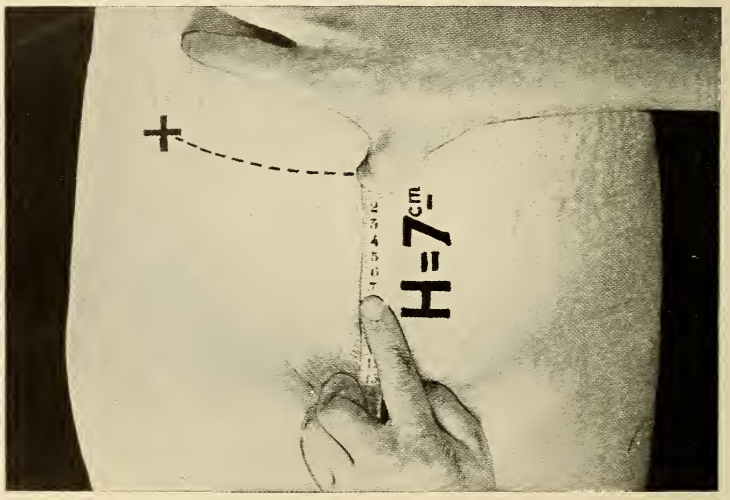


FIG. 40.—Measuring height of the anterior shoulder above the pelvic brim.

much farther from the median line than in anterior positions. The examiner should remember that the R. O. P. position is, next to the L. O. A., the most common position.

The Fetal Shoulder.—Having determined the position of the back, it is well to locate the anterior shoulder (Fig. 39). This is a matter of considerable importance, and one very commonly neglected. Most teaching, both text-book and clinical, is very deficient in this respect. I am accustomed to say to my students, that when they can locate the shoulder in a case of average difficulty, they have become fairly proficient in the external examination of pregnancy.

There are two methods. In the first the fingers are carried downward along the dorsal plane until a sudden depression is encountered. This depression is the neck, and just above it, is the shoulder. The latter is felt as a small knob-like projection, fixed, or at least not as movable as the

"small parts" already mentioned. Another method, and one which I myself have found very useful, is first to locate the head, and then carry the fingers upward until the shoulder is felt.

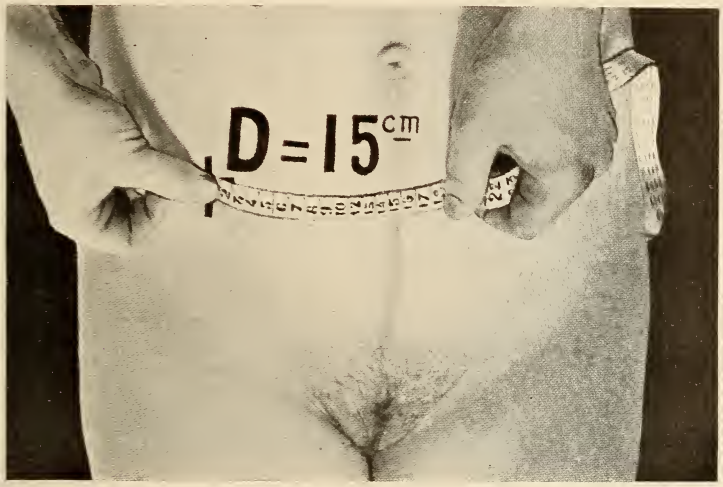


Fig. 41.—Measuring the distance of the anterior shoulder from the median line in R. O. P. position.

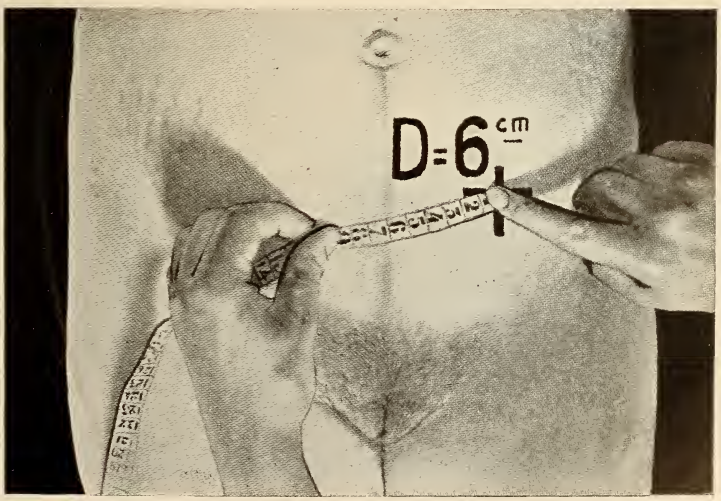


Fig. 42.—Measuring the distance of the anterior shoulder from the median line in L. O. T. position. The cross also corresponds to the maximum intensity of the fetal heart.

Of course the shoulder cannot always be felt; but it can be felt in the majority of cases. Fabre has estimated that it can be recognized in about ninety per cent. of all cases and this corresponds with my own experience. Its recognition is easier in primiparæ than in multiparæ.

FIG. 43.—Locating the shoulder. Note that it is far above the pelvic brim, showing that the head has not engaged. Position R. O. A.

Among the causes that sometimes prevent its recognition are hydramnion, twin pregnancy, death of the fœtus, prematurity or small size of the fœtus, and thickness of the abdominal wall.

What is gained by locating the shoulder? There are several advantages. In the first place, it aids very materially in determining the relation of the head to the pelvic brim. Careful observations have shown that

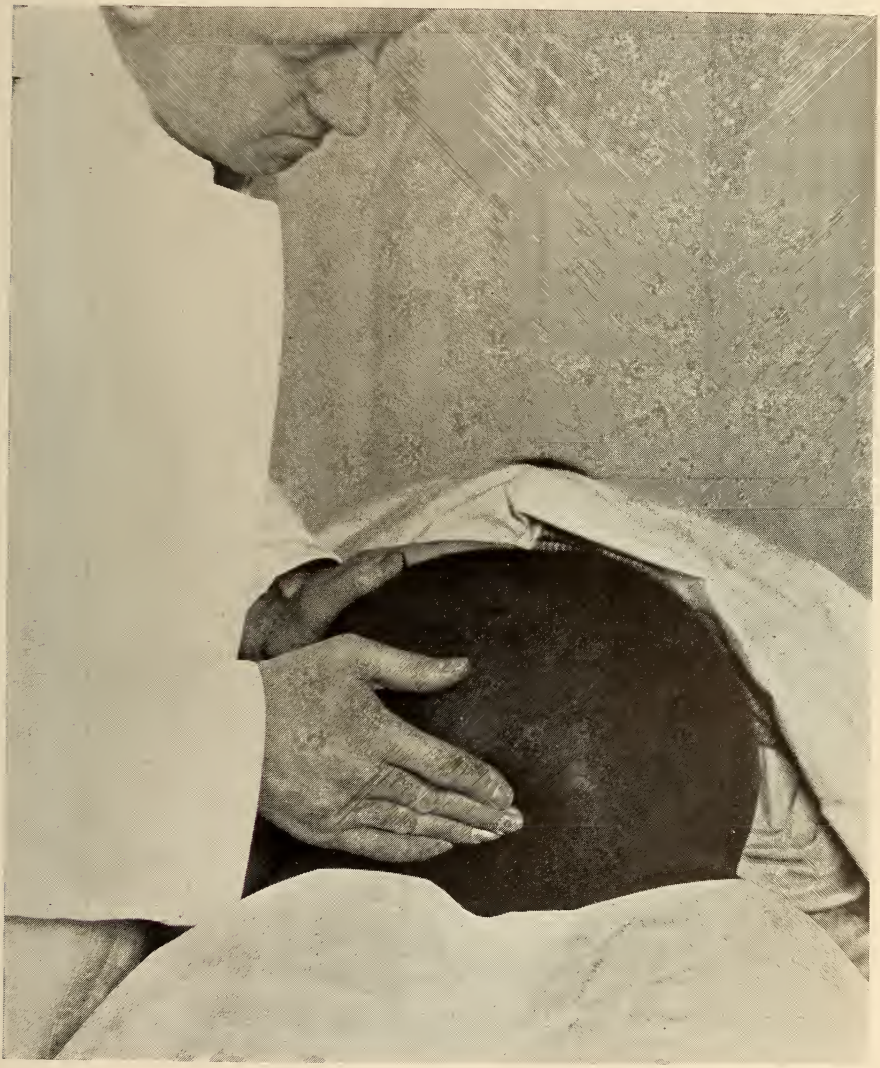


FIG. 44.—Locating the shoulder. The same patient three weeks later. Note the shoulder is less than seven centimetres above the pelvic brim.

the average distance between the greatest diameter of the fetal head, *viz.*, the biparietal diameter, and the shoulder, is about seven centimetres. It follows, that if the shoulder is much more than seven centimetres above

the brim, it has not engaged, whereas if the distance is much below this its engagement is certain (Figs. 40, 41 and 42).

It is quite true that when the head is far above the brim, or deeply engaged in the pelvis, we do not need confirmation of the fact; but there are certain cases in which it is difficult to determine its exact location,

FIG. 45.—Bimanual palpation. Note that the finger tips alone come in contact with the head.

and, in these, I have found a knowledge of the position of the shoulder of the greatest value (Figs. 43, 44 and 45).

Again, the location of the shoulder affords valuable confirmatory evidence of the position of the occiput, for experience shows that the shoulder is about twice as far from the median line in posterior, as in anterior, positions.

Then, too, in doubtful cases, a knowledge of the position of the shoulder may aid us in our search for the fetal heart. It has been shown that the site of maximum intensity of the heart sounds corresponds quite closely with the position of the shoulder.

FIG. 46.—Palpating the fetal head above the brim. Bimanual method.

Let me impress upon the mind of the reader that the palpation of the fetal shoulder, so commonly neglected, is not an unnecessary refinement of diagnosis, *but a measure of undoubted clinical value.*

The Fetal Head.—We now come to the palpation of the fetal head, perhaps most important of all. The head is recognized as a large globular body communicating to the palpating fingers a sensation of solidity and

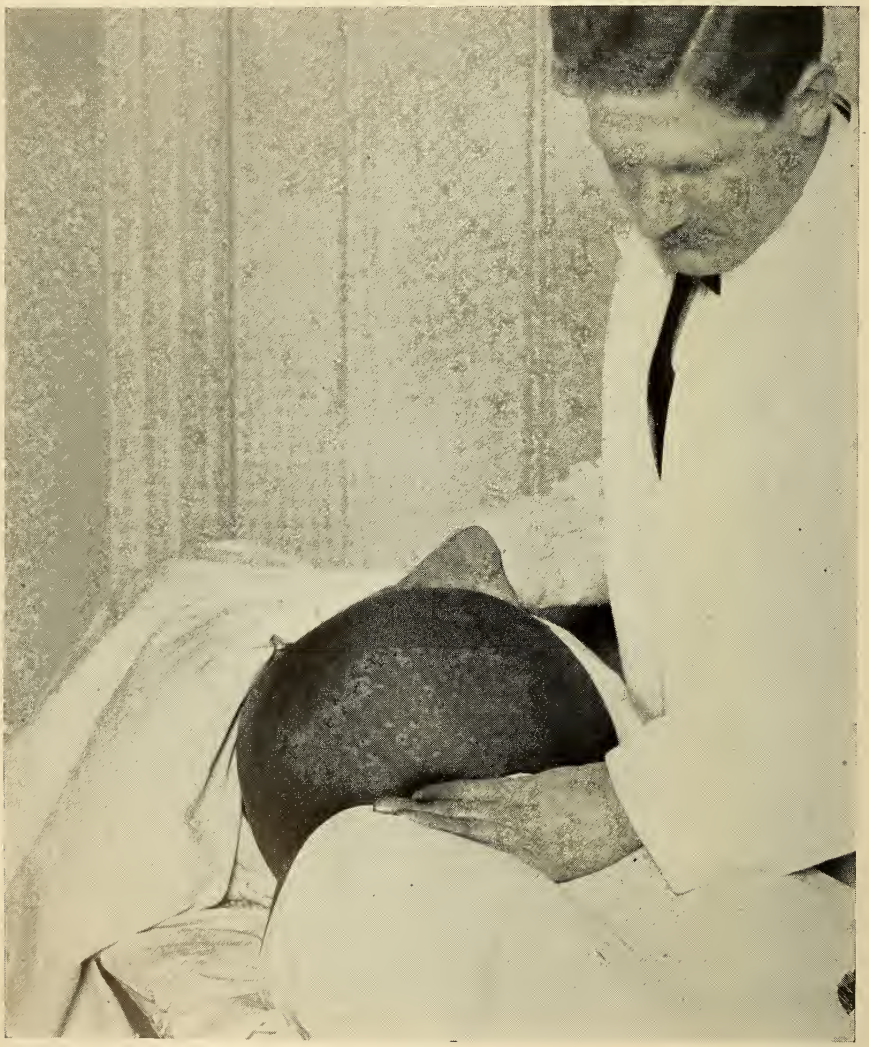


FIG. 47.—Palpating the head by the unimanual method.

hardness, quite different from that of any other part of the fœtus. Let the student familiarize himself with this at the outset. If the practitioner has not done so, let him begin now. It is a matter of prime importance, indeed it is an absolute necessity, that every obstetrician should be able to

recognize the fetal head by palpation, to determine whether it is above or below the brim of the pelvis, and if it is absent from its usual position at the brim or in the cavity, to recognize the fact. *It is as important to determine its absence as its presence,* for the absence of the head from its usual position constitutes the one immediate and positive evidence that

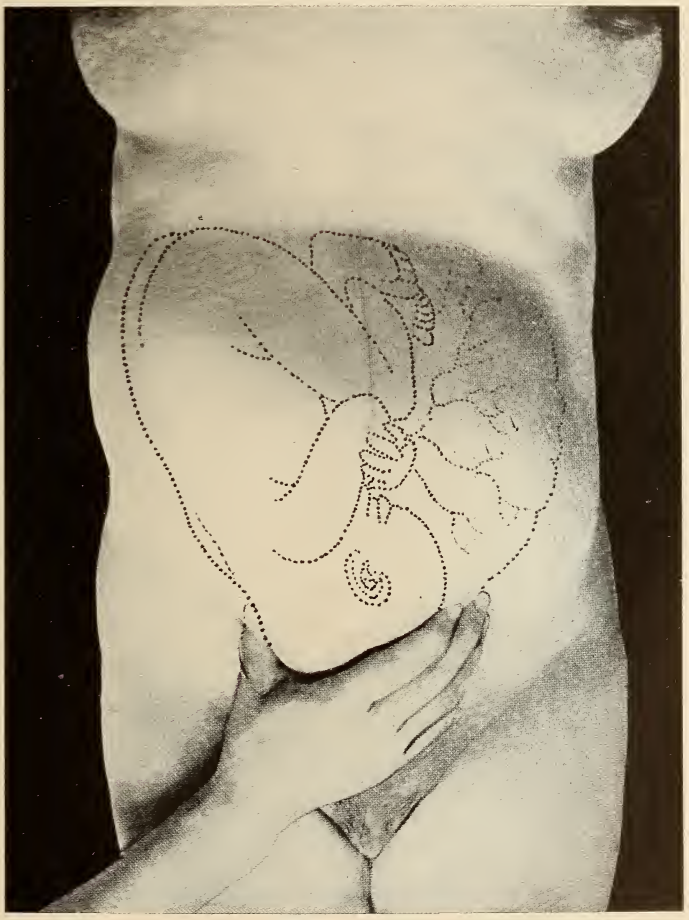


FIG. 48.—Unimanual palpation; head movable.

the obstetrician has to deal with a breech presentation or a transverse position.

How shall we palpate the head? In the first place, let the beginner remember that, in the last few weeks of pregnancy, he will find the head above the brim in multiparæ, and in the cavity in primiparæ. Since most of our patients are multiparæ the head will, in the majority of cases, be

found above the brim. This is true not only of pregnancy but as we shall see later of the first stage of labor. Let us first look for it, then, where we shall ordinarily find it, just above the brim of the pelvis.

The method of palpating the head above the brim is shown in Figs. 46

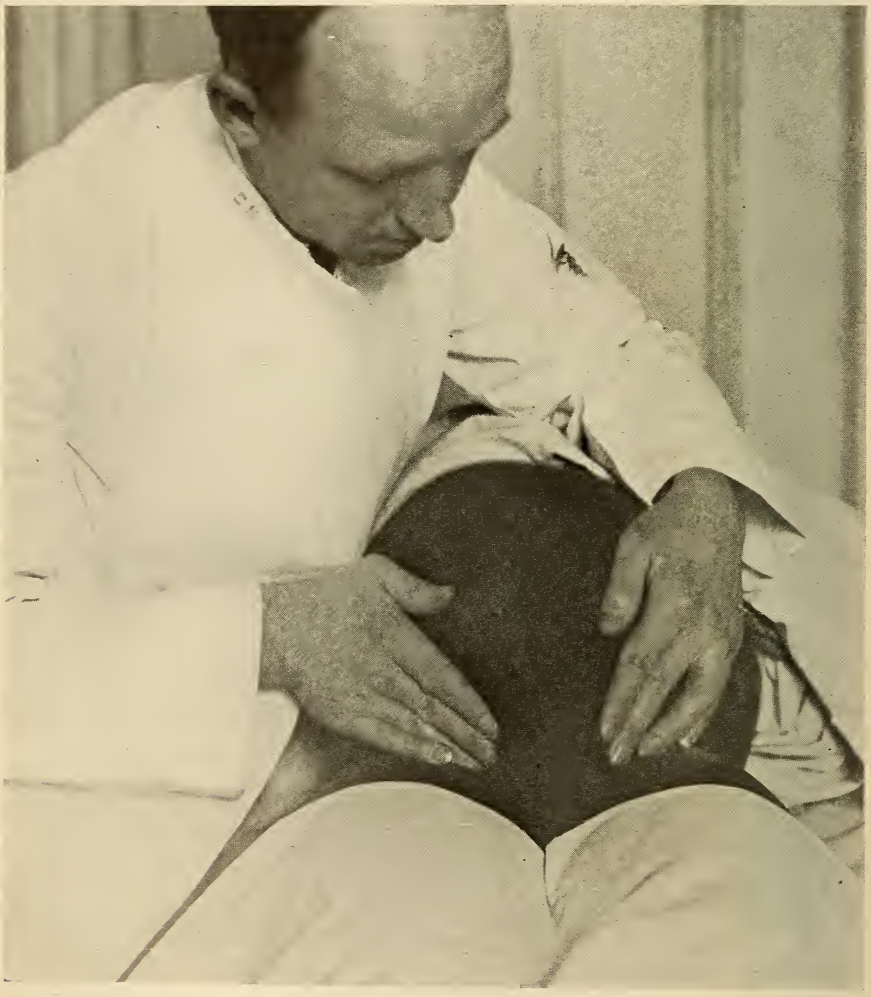


FIG. 49.—The same case as Fig. 47, three weeks later. Note that the examiner is obliged to sink his finger tips a little below the pelvic brim. The unimanual method can no longer be employed.

and 47. The tips of the fingers of both hands are placed as in the illustration, and the abdominal surface is depressed. The patient should be thoroughly relaxed, and there should be no sudden or rough movements. These always excite resistance and defeat the object of the examination.

If the abdomen is depressed very slowly and gently, the patient need suffer no great inconvenience. The tips of the fingers are then brought together from side to side and the head is found between them. The mistake of the beginner is to bring the fingers together too soon, thus missing the head.

Figs. 48 and 49 show another method. One hand only is used. This method is not applicable when the head is deeply engaged, but is very useful and convenient when the head is floating above the brim. Note that the thumb and index finger are actually between the head and the symphysis pubis. Fig. 49 shows a case in which a small segment of the head has entered the pelvic brim. "The head has engaged." Here flexion is more marked. Note the greater prominence of the forehead, and that on the right side one can follow the great convexity of the forehead and face for a comparatively long distance, while on the left one can palpate only a small segment of the occiput. Remember that this fact is an aid in diagnosis, *i.e.*, in distinguishing between a right and a left position. The beginner will find such cases the most difficult. It is necessary to carry the fingers well down into the cavity of the pelvis but they cannot be carried below the head. Nevertheless, with a little practice the head can be recognized. In this case pressure is not made directly downward, *i.e.*, toward the floor, but diagonally forward, in the axis of the pelvic canal.

It is an absurdity to try to outline the breech which has no very characteristic outline. When the head, shoulder, and back have been located there should be no difficulty in locating and palpating the breech. Nor is it necessary to locate the small parts, in anterior positions, since if we know where the head, back, and breech are, we know where the small parts must be. The recognition of the small parts in front, however, is, as already noted, valuable confirmatory evidence of a posterior position of the occiput.

The Fetal Heart.—In 1818, Mayor, of Geneva, made the epoch-making discovery that the fetal heart can be auscultated through the abdominal wall. It seems strange that the world had to wait so long for this discovery, but not more strange perhaps than that even now so many men who call themselves obstetricians fail to avail themselves of it. Every student and practitioner should take advantage of every opportunity to listen to the fetal heart. He should never forget that he has two patients under his care, and that it is his duty to keep himself informed as to the condition of both.

There are two methods of auscultating the fetal heart—the direct method, in which the ear is applied to the abdomen, and the indirect method, in which the stethoscope is used. *It is absolutely necessary that both methods should be learned.*

The indirect method is usually the most convenient, and the sounds can be better localized with, than without, the stethoscope.

The direct method, however, has certain important advantages. It can be used when one has no stethoscope at hand. Moreover, during forceps operations and versions the operator should not contaminate his hands by touching the stethoscope. It may be noted in passing that the French have devised a stethoscope that can be sterilized (Fig. 50).

In using the direct method the ear is applied closely, but not heavily, to the abdomen, which is first covered by one layer of gauze; not by a towel, as is often suggested. No one who knows much about the fetal heart will try to hear it through a towel.

Fig. 50.—Monaural stethoscope; made of aluminum and can be boiled for use during labor.

In using the stethoscope, one should not touch the instrument with the hands, but should keep it applied to the abdomen by a rubber band. This simple manœuvre, familiar to the house surgeons in maternity hospitals, excludes many undesired vibrations, and simplifies the matter more than one would suppose. In either case absolute silence should be maintained in the room (Fig. 51).

What does the fetal heart sound like? Perhaps the familiar comparison of a watch under a pillow is as good as any, but no description is satisfactory. In order to know what the fetal heart sounds are like, one must

listen to the fetal heart. Opportunities are frequent, and there is no other way. The rate averages between 120 and 160 beats per minute. The sound is a double one, systole and diastole, as in the adult, but the interval

FIG. 51.—Listening to the fetal heart without touching the stethoscope.

between the pairs of sounds is so short that it is only recognized with care, and the beginner always thinks of the fetal heart sound as a single one.

Where is the fetal heart best heard? This depends upon the position of the fœtus, and the period of pregnancy. In the eighth and ninth months

of pregnancy, and in the L. O. A. position—in other words, in about sixty-five per cent. of all cases—it will be heard most plainly on the left side, about half-way between the umbilicus and the anterior-superior spine of the ilium. It is almost universally taught that in the R. O. A. position the maximum intensity of the fetal heart sounds will be at the same relative point on the right side. *This is a palpable error.* A moment's reflection will show that in right positions the left side of the fœtus will be nearer the median line than in left positions. And thus we find it in practice. In right anterior positions the fetal heart sounds will be heard most plainly at about the same height as in left positions but much nearer the median line.

In posterior positions, the heart sounds will be found about twice as far from the median line as in anterior positions. If in these cases the head is above the pelvic brim they will be heard far around in the flank. If the head has become engaged they will be heard four to six inches from the median line.

Of course these rules are subject to many variations, but they are sufficiently exact to be of much practical value.

It is evident that whatever causes the fœtus as a whole to occupy a higher level will have the same effect upon the fetal heart. Thus, in a case of marked pelvic contraction, the heart sounds will be heard at a higher level than usual, and when the head has descended into the pelvic cavity, as it does in a primipara in the latter weeks of pregnancy, they will be heard at a lower level. It is an ancient fiction of the text-books that the heart sounds are heard above the umbilicus in breech presentations, but there are so many exceptions to this rule that it is best to disregard it. During the second stage of labor, when the head is on the pelvic floor, the heart sounds are heard not far from the symphysis; a fact too often forgotten.

During the fifth and sixth months, one should seek for the heart sounds in the median line below the umbilicus. He will often seek in vain. At this time, however, the viability of the child is not in question, and aside from the question of the diagnosis of pregnancy, the matter is of no great practical importance.

But the fetal heart is not the only sound that we must learn to recognize. There are also the uterine, and the fetal souffles already mentioned. The former is in itself of no great diagnostic importance, but the latter may be of great value. In the absence of the fetal heart sounds the presence of the fetal souffle may be regarded as their equivalent.

Internal Examination.—There is little danger of infection from vaginal examination during pregnancy, but it is always well to wash the hands thoroughly with soap and water, to wear sterile rubber gloves, and to immerse the gloved hand in lysol solution. All this is especially important if the examination is toward the end of pregnancy, when it is certain that labor cannot be far away. Now and then in the course of an ante-

partum examination one finds the patient in the first stage of labor, though the existence of labor has not been previously suspected.

Moreover, refined and sensitive patients always appreciate precautions of this kind. The rubber glove not only protects both patient and physician from infection, but, when lubricated with lysol, renders the introduction of the fingers much easier and much less disagreeable to the patient.

The examiner should note the condition of the vagina and its outlet with reference to size and distensibility, and should note the condition of the cervix. Bad cervical tears often indicate that the patient has had difficult operative deliveries, and the reason for this should be sought. The fingers, however, should not be passed within the cervical canal without good reason. This involves too much risk of infection. Tumors large enough to obstruct delivery can hardly escape attention.

Of course the most important part of the internal examination is the estimation of the internal pelvic measurements and particularly of the true conjugate diameter. But there are many cases in which we know in advance that these measurements are sufficient. For example, if there is a history of easy labors, ending in the delivery of children of good size, we may exclude pelvic contraction. Again, if, in the case of a primipara, the examining finger encounters the head almost at the vaginal outlet, it is plainly unnecessary to search for contraction at the brim. The measurement of the pelvic outlet, *which should never be omitted,* is part of the external examination.

If, however, the patient has a history of difficult labor, or if, in the case of a primipara the head remains above the brim during the latter weeks of pregnancy, or if there is anything in the patient's history or appearance that suggests pelvic abnormality, the examination should be careful and thorough. The technic of pelvimetry, and the general subject of the diagnosis of pelvic contraction, are considered with the latter subject.

Of course the antepartum examination will be valuable or not according to the experience and skill of the man who makes it. Its importance, however, should stimulate every man who intends to practice obstetrics to master the physical diagnosis of pregnancy. It is not a subject of extreme difficulty and what it reveals is of the greatest possible importance.

Then, too, this systematic mapping out of the fetal parts, and measuring of the pelvis, are of great value to the physician. If he will but study each case, as it comes before him, following the methods here outlined, remembering that he can discover more by a very light touch than by rough manipulations, and that he should palpate with the tips of the fingers, not with the palms of his hands, the results will amply reward him.

CHAPTER V

THE FŒTUS IN UTERO. CLASSIFICATION OF ITS DIFFERENT POSITIONS AND PRESENTATIONS

Before we can intelligently discuss the physiology of labor, or make any pretensions to a knowledge of obstetric diagnosis, we must know the topography of the fœtus, and its immediate surroundings.

Here, as elsewhere, we must first learn the technical vocabulary of the subject. It is necessary to fix in our minds, at the outset, the meaning of three terms which have become imbedded in the obstetric literature of every modern language, *viz.*, attitude, position, and presentation.

Attitude.—By this term is meant the manner in which the different parts of the fœtus are disposed in relation to each other. The normal attitude of the fœtus can be better illustrated than described. It is well shown in the accompanying illustration (Fig. 52). The reader will observe how the head is flexed upon the chest, the arms folded, the legs flexed upon the thighs, and the thighs upon the body. King has aptly compared this position to that of one who is trying to keep warm in bed upon a cold night. It is a matter of every-day observation that the fœtus retains this attitude, or something resembling it, for hours or even days after birth. What is the reason for this attitude? At first thought it would seem that it is the result of the accommodation of the fœtus to the limited space which is reserved for it. This is undoubtedly true, so far as it relates to the latter months of pregnancy, and is especially evident in cases in which there is very little liquor amnii, and the fœtus is exposed to unusual pressure. Here the fœtus becomes a veritable mould of the uterine cavity.

That there must be some other cause for this attitude, however, is shown by the fact that it is assumed early in pregnancy, when the fœtus is simply floating in the amniotic fluid, and there can be no question of compression.

Various theories have been advanced, but none are satisfactory. Whatever the cause, the object which nature has in view is plain. The fœtus in this, its typical attitude, forms a comparatively symmetrical ovoid, taking up less room than it would otherwise occupy. Moreover the whole fœtus constitutes, for the time being, a compact body, through which the propelling forces can be effectively transmitted. This is especially true after the rupture of the membranes.

Position.—The term position is used in two senses. The beginner will avoid confusion by learning to distinguish them before going further.

The primary meaning of the term "position" is the relation of the fœtus as a whole to the long axis of the uterus. Using the term in this sense, there are three positions—longitudinal, transverse and oblique.

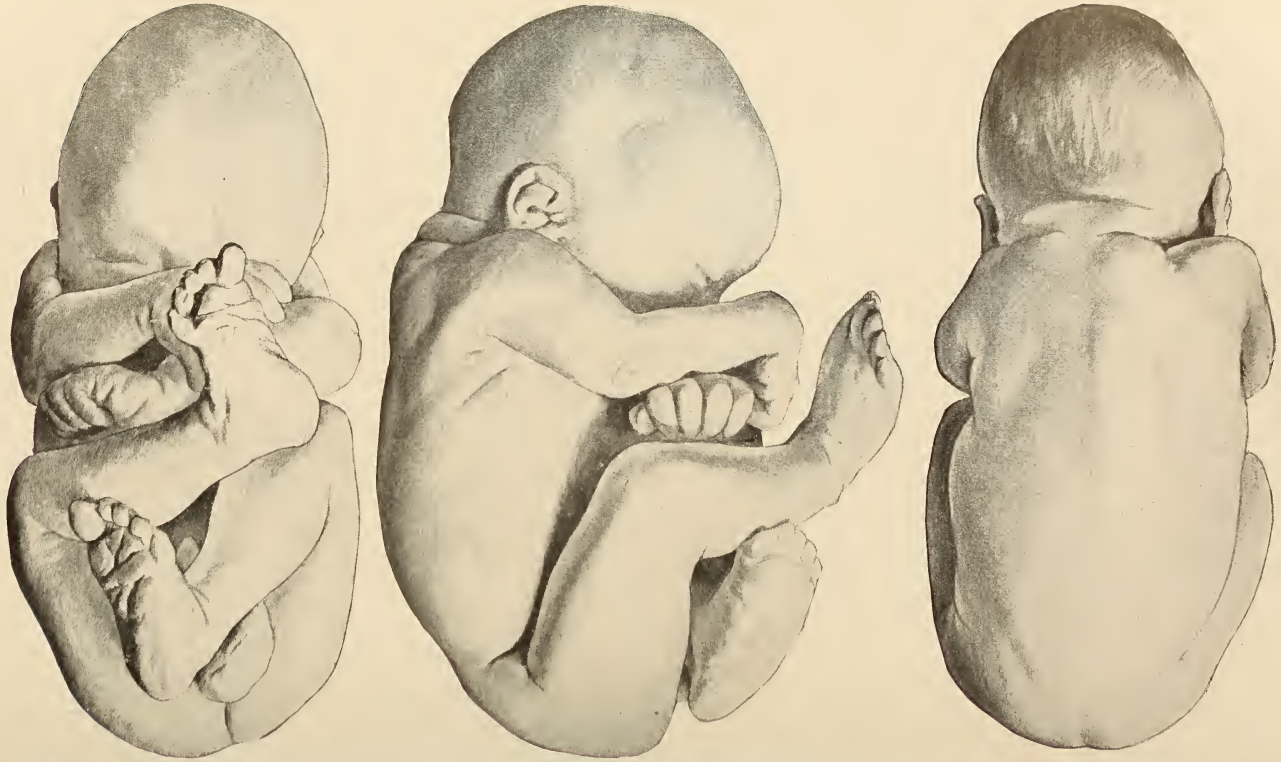


FIG. 52.—Normal attitude of fœtus in utero. Amniotic fluid plentiful. Oblique Diameter 28 cm. From "A Research on the Topographical Anatomy of the Fœtus in Situ," by J. H. Chievitz, Copenhagen, 1899.

When the long axis of the fœtus corresponds to that of the uterus the position is longitudinal. There can, of course, be only two longitudinal positions, according to which end of the fetal ovoid presents, the head or the breech. The terms transverse and oblique explain themselves. Strictly speaking, a true transverse position, as an obstetrical complication, is rare. Such a position, however, may occur if the fœtus is small and the amount

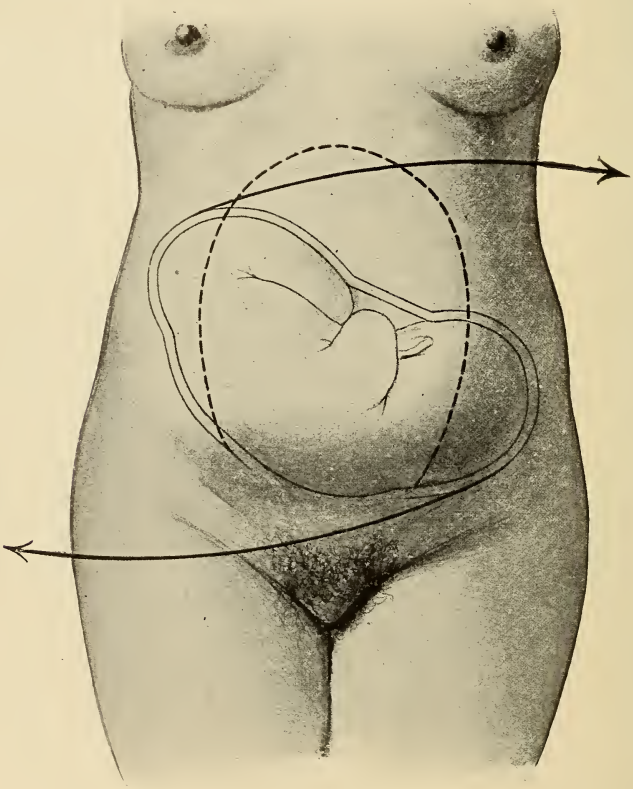


Fig. 53.—Mechanism of uterine contractions in transverse position of fœtus.

of liquor amnii large. Most so-called transverse positions are really oblique positions, the shoulder being the presenting part.

One often hears the phrase, " transverse presentation," used as synonymous with transverse position, but the term should be discarded not only because it is bad English, but because it serves to confuse the student.

The second meaning of the term position is the relation of the presenting part to the birth canal or some one of its parts. Thus we may say of the head as a whole that it is above or below the brim; or of the occiput, that it is anterior or posterior, to the right or to the left.

During the first half of pregnancy the fœtus is relatively small, and may occupy almost any position, but in the latter months it usually becomes longitudinal, and remains in this position. Transverse and oblique positions, at term, are exceptional.

What is the reason for this?

The following explanation seems the most plausible. As the fœtus increases in length, it finally reaches a point at which it cannot assume a transverse or oblique position without coming into contact with the uterine wall. This contact excites uterine contractions, and the subjoined illustration shows clearly how these contractions, by directing the head and breech in opposite directions, cause the fœtus to assume a longitudinal position, and tend to maintain it in this position (Fig. 53).

Presentation.—The term presentation is best defined by illustration. When we speak of the presenting part of the fœtus, we mean that part which has descended farthest in the pelvis, and which is most easily reached by the examining finger. The presentation is named after the presenting part. The term may be used in a general or a specific way, *e.g.*, we speak of a head presentation in contradistinction to one of the breech. But head presentations may be subdivided into those of the occiput, brow, and face, and even these may be again subdivided, as we shall see directly. Again in a vertex presentation, or presentation of the top of the head, the occiput may point either forward or backward, to the right or to the left, and we may have a left occiput anterior presentation, a right occiput posterior, etc.

Classifications of the Various Presentations.—Various schemes of classification have been devised. The Germans name the presentations first, second, third, etc. This is objectionable, as employing arbitrary symbols, instead of giving names that describe something and compel recollection.

As we have already seen, the great majority of all presentations are those of the occiput. The reason for this we will consider later. At present we have to do only with the fact.

These occipital presentations are divided into four classes, according to whether the occiput points anteriorly, or posteriorly, to the right, or to the left. Thus the most common, that in which the occiput points forward and to the left, is called the left occipito anterior, or L. O. A., and the presentation second in frequency, in which the occiput is directed posteriorly and to the right, is called the R. O. P. presentation. In both cases the head occupies the right oblique diameter of the pelvis, *i.e.*, the oblique diameter which begins at the right sacro-iliac synchondrosis. When the head occupies the left oblique diameter, we have the R. O. A. and the L. O. P., positions much less frequent, as we shall see. In Figs. 54 to 69 these positions are diagrammatically represented.

Of course one can imagine any number of intermediate presentations. The older writers, with their love of detail, had hundreds of them. Even

now, some include anteroposterior cases, *i.e.*, cases in which the occiput is directly behind the symphysis. These, however, when they do occur,

FIG. 54.

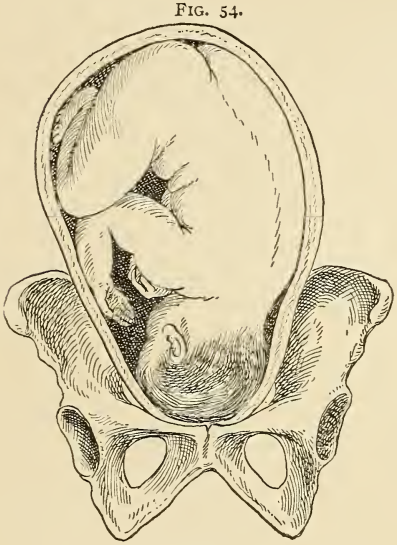


FIG. 55.

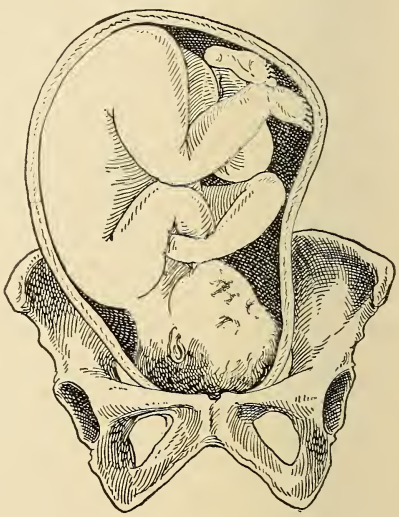


FIG. 56.

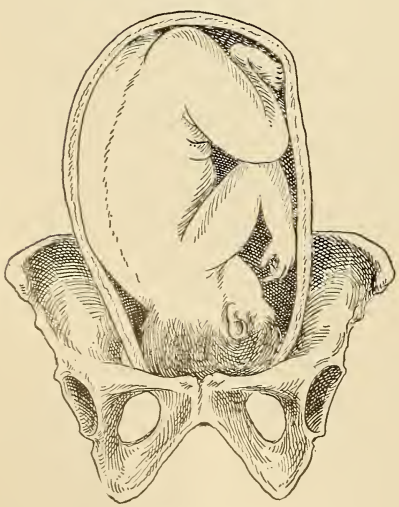
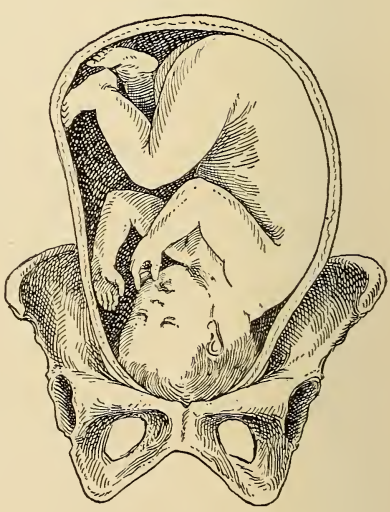


FIG. 57.



Positions of occiput in order of frequency. (After A. F. A. King, M.D.)

are to be regarded as distinctly pathological, since, with a head of average size, delivery in this position is difficult or impossible.

Since the vertex often presents transversely above the brim and in

other cases, especially in multiparæ, does not rotate until it has reached the floor of the pelvis, many writers use the term left occiput transverse,

Fig. 58.

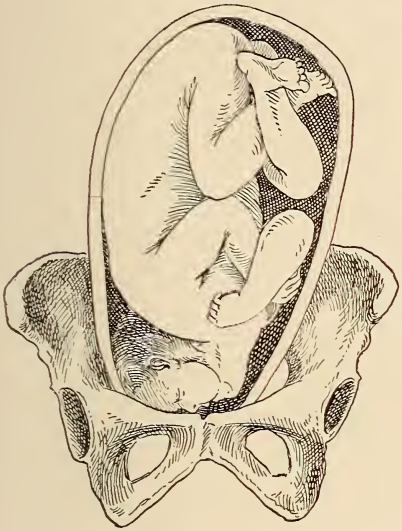


Fig. 59.

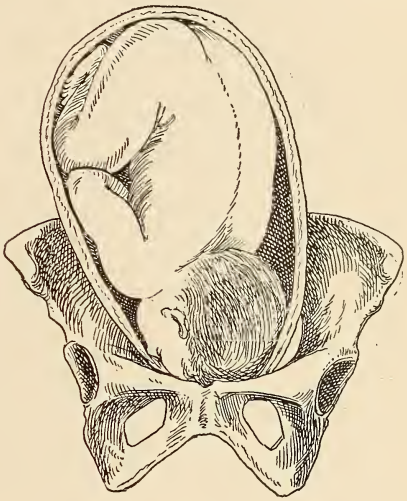


Fig. 60.

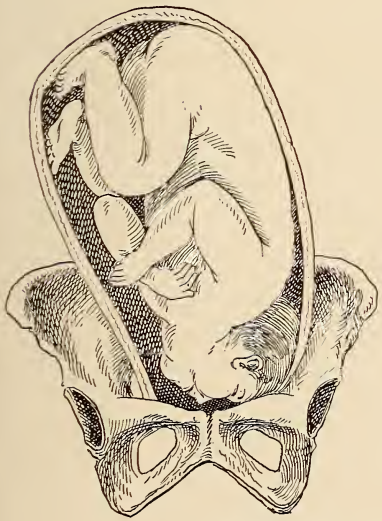
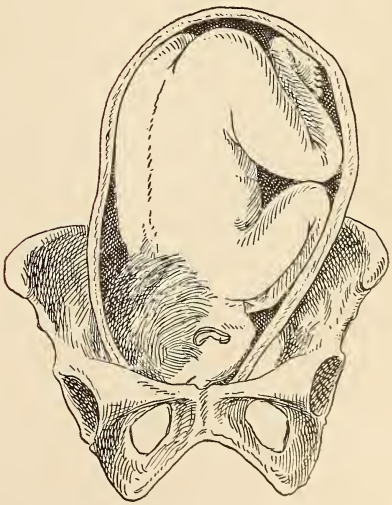


Fig. 61.



Positions of face presentation. (After A. F. A. King, M.D.)

L. O. T., and right occiput transverse, R. O. T.; for this there is more justification, but after all a transverse position of the vertex is merely a stage of rotation, and must eventually become either anterior or posterior.

The reader must have noticed, by this time, that presentations of the cephalic extremity embrace the great majority of all presentations and that

Fig. 62.

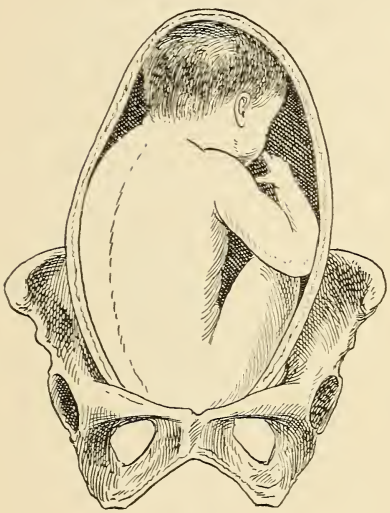


Fig. 63.

Fig. 64.

Fig. 65.

Position of breech presentation. (After A. F. A. King, M.D.)

the head usually occupies the left oblique diameter; in other words that it is usually in the L. O. A. or the R. O. P. position.

Two questions naturally arise here. Why does the head usually present,

and why, when it does present, does it usually occupy the right oblique diameter?

Why are cephalic presentations the rule, and other presentations the exception?

Fig. 66.

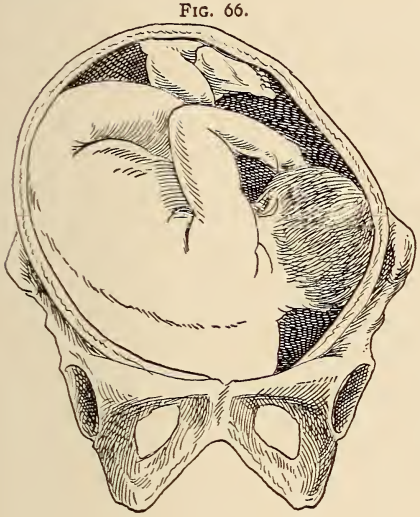


Fig. 67.

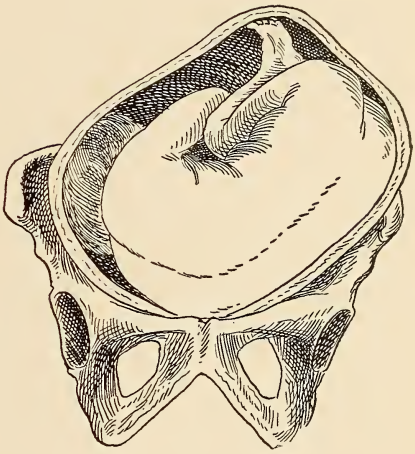
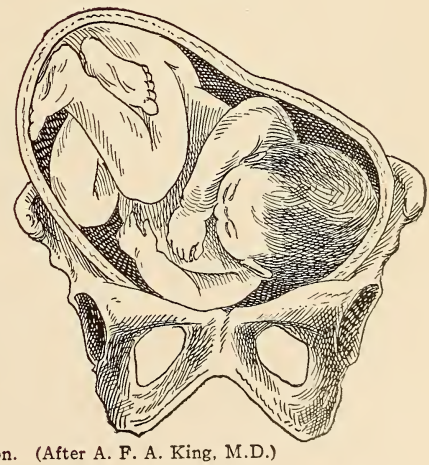


Fig. 68.

Fig. 69.



Position of shoulder presentation. (After A. F. A. King, M.D.)

The position of the head has been attributed to gravitation. The head sinks to the bottom of the amniotic pool, it is said, because it is the heaviest part of the fœtus. This theory might conceivably apply to the latter part of pregnancy, but not to the earlier part when the head is relatively small.

According to another theory, the position of the head is the result of a process of accommodation; the head fits best into the lower uterine segment. When it is located elsewhere the fœtus is uncomfortable and reflex movements are excited. Neither of these theories is very satisfactory. Bumm has made the shrewd observation that once the head has settled into the lower uterine segment, its size and weight make its dislodgement a difficult task for the fœtus. This of course applies only to the latter months of gestation.

Why does the fetal head, in the great majority of cases, occupy the right oblique diameter of the pelvis? In other words, why do the L. O. A. and R. O. P. presentations comprise the vast majority of all presentations? The most plausible explanation is that already given for the common right obliquity of the uterus, *viz.*, the position of the rectum and sigmoid flexure.

Another question must by this time have occurred to the reader. Why does the occiput usually point forward? Or in other words, what is the reason for the preponderance of the left anterior position?

As a matter of fact, it is not as much more frequent than the posterior positions as it is usually supposed to be. As noted in the above diagram, the occiput is originally posterior and to the right in about one-third of all cases. The fact that it usually rotates during labor and is delivered in an anterior position, leads those who do not practise the external examination of pregnancy to believe that it is much less frequent than is really the case.

Nevertheless, the fact remains that anterior positions are at least twice as common as posterior ones. The most reasonable explanation seems to be, that this is the result of accommodation between the fœtus and the structures anterior and posterior to the uterus; the concave abdominal surface of the child, adapting itself more readily to the outward curve of the lumbar spine.

Figs. 54, 55, 56 and 57 show the principal varieties of occiput presentation, as usually observed in multiparæ. As we shall see in studying the mechanism of labor, the head occupies an altogether different position in primiparæ who are near term. During the latter weeks of pregnancy, the head, in the case of a multipara, is normally above the brim and only moderately flexed, while in the case of a primipara, it is well down in the pelvic cavity, and well flexed. The student should fix this fact firmly in his mind, for without it he cannot intelligently practise the antepartum examination, or study the mechanism of labor.

But the occiput is not always the index of classification. In face presentations, to be discussed later, it is the chin (Latin, *mentum*). Thus we have the left mento anterior, or L. M. A. position, etc. These are shown in Figs. 58, 59, 60 and 61. In breech presentations the index is the sacrum and we have the left sacro anterior, etc., as shown in Figs. 62, 63,

64 and 65. In shoulder presentations the index is the scapula and we have the left scapula anterior, etc. (Figs. 66, 67, 68 and 69).

To sum up then there are two principal *positions* of the fœtus in utero, longitudinal and transverse, the latter including oblique positions, which indeed constitute the great majority of this class of cases.

There are four principal *presentations,* those of the occiput, face, breech, and shoulder, subdivided as follows:

Presentations of the occiput: L. O. A., R. O. A., R. O. P., L. O. P.

Presentations of the face: L. M. A., R. M. A., R. M. P., L. M. P.

Presentations of the breech: L. S. A., R. S. A., R. S. P., L. S. P.

Presentations of the shoulder: L. Sc. A., R. Sc. A., R. Sc. P., L. Sc. P.

This list might be further extended, but for the sake of simplicity and clearness it is better to leave it as it is. Presentations of the foot and knee are to be regarded as modifications of breech presentations, those of the hand as modifications of presentations of the shoulder. A brow presentation is really an incomplete face presentation. Compound presentations, *i.e.*, the simultaneous presentation of two or more parts, a hand and a head, a foot and a head, etc., defy classification. Presentations of the abdomen and back are obstetric curiosities and can only occur when the fœtus occupies a transverse position. Descent of the cord is sometimes called presentation of the cord, but this, of course, is not a presentation at all, but a prolapse.

CHAPTER VI

THE PHYSIOLOGY AND MECHANISM OF LABOR

In the term labor are included those phenomena which accompany the expulsion of the fœtus and its appendages. In order that we may discuss the subject intelligently, it is necessary to consider with some care the fetal head, the chief obstacle to delivery, and the canal through which it must pass; or to use the quaint but expressive phraseology of the older writers, the passage and the passenger. Having done this we will be in a position to consider the forces by which delivery is accomplished and the mechanism necessary for its completion.

The Birth Canal

The term birth canal, a comprehensive and useful, if not elegant, one, is employed to designate the channel through which the fœtus must pass on its way to a new existence. This channel is formed by the bony pelvis, and the soft parts which line its cavity and close its outlet. A general knowledge of these structures is presupposed and reference will be made here only to certain features which require special attention.

The Pelvis.—Let us look first at the normal female pelvis, and see how it differs from that of the male. It is evident that all these differences are designed to make the process of labor easier than it otherwise would be.

Let us then look at the pelvis of infancy and note that changes, obviously for the same purpose, occur as the child grows into womanhood.

A knowledge of these differences will help us when we come to the study of pelvic contraction, for we will then see how this contraction is often due to a persistence of the infantile type of pelvis, or of an approximation of the female pelvis to the masculine type (Figs. 70, 71, 72 and 73).

First of all the student should learn well the form and dimensions of the normal female pelvis, and the axis of its canal. It is convenient and perhaps necessary to recall the planes of the brim and outlet, but for practical purposes this is all that is necessary.

Attempts to simplify the matter by geometrical puzzles have only served to make tiresome and difficult a subject that is, in its essentials, not difficult of comprehension, with the result that the student regards it with horror, and forgets it as soon as possible, while the practitioner does not read it at all. It is of course possible to construct or imagine an infinite number of planes in the pelvic cavity, but the result is confusion rather than enlightenment. Some writers speak of the internal lateral surfaces of the pelvis as the inclined planes of the pelvis. This serves only to add to the confusion of the student. Of course these so-called inclined planes are not planes at all, in the mathematical sense of the word.

They were formerly considered of great importance, as effecting the forward rotation of the occiput, but, as we shall see presently, their influence in this respect is theoretical rather than practical.

Taking up now the normal female pelvis, we see at once that it is composed of the two innominate bones together with the sacrum and coccyx, and that it is divided by a natural line of division into two parts. These parts are called the true and the false pelvis, and the line of division is our old friend of student days, the *linea iliopectinea.*

The False Pelvis.—The false pelvis, the upper part, interests us

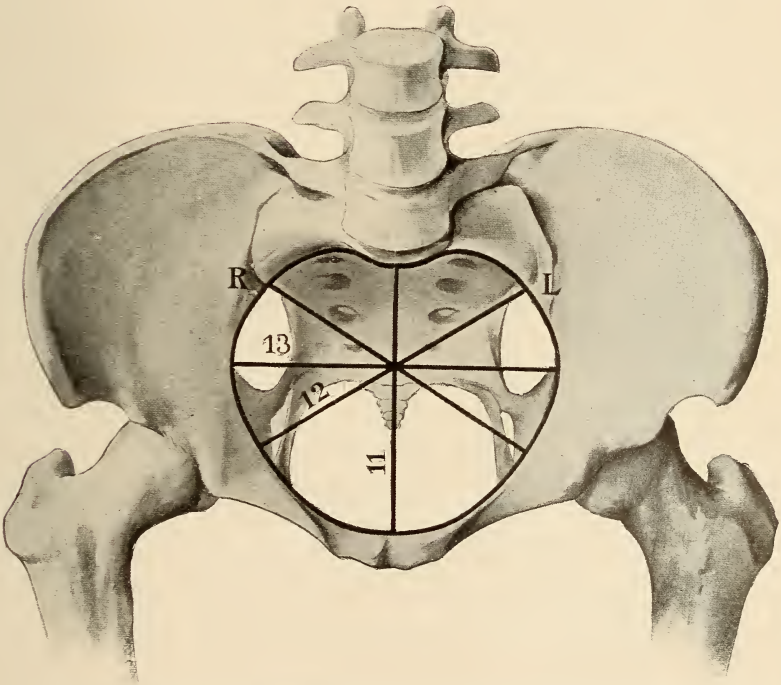


Fig. 70.—Normal female pelvis viewed from above. Boundary and diameters of inlet drawn in.

principally from the standpoint of diagnosis. Of course it offers no resistance to the progress of labor, but as we shall see later it does offer certain landmarks for the practice of pelvimetry or pelvic measurement, and by its shape and inclination aids us in estimating the character of the true pelvis, and in diagnosing certain forms of pelvic deformity.

The True Pelvis.—The true pelvis is full of practical interest. It falls naturally into three divisions, brim, cavity, and outlet.

The Pelvic Brim.—The pelvic brim, inlet, or superior strait, as it is variously called, is bounded in front by the symphysis pubis, behind by the promontory and alæ of the sacrum, and on each side by the linea ilio-

pectinea. In the erect posture the plane of the brim makes an angle of 55 to 60 degrees with the horizon. The inclination of the brim is, however, a very variable quantity changing with the position of the patient. More important are the diameters of the brim, for a slight diminution in size of this bony barrier to the progress of labor may result in disaster.

These so-called " diameters " are simply the average distances between certain fixed points. The reader will note as he proceeds that like the " planes " mentioned above they are not diameters at all in the mathematical sense.

The diameters of the brim are, the anteroposterior or conjugate diameter, the transverse diameter, and the right and left oblique diameters.

Most important of all is the anteroposterior, for it is the shortest diameter of the brim, and moreover anteroposterior contraction at the brim

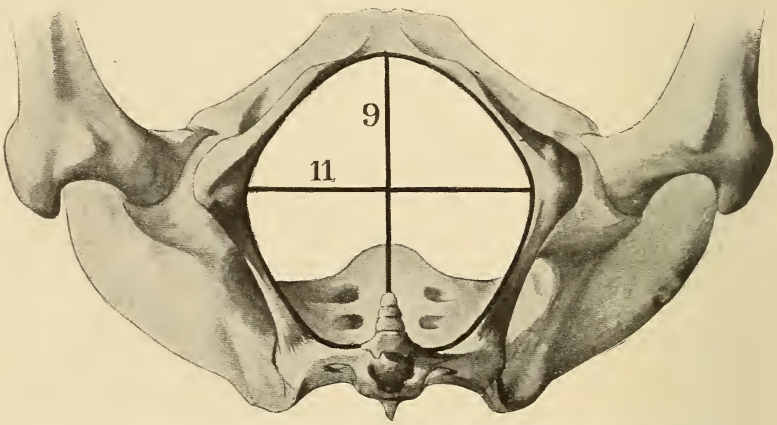


FIG. 71.—Normal pelvis viewed from below. Boundary and diameters drawn in.

is the most common form of pelvic contraction. This diameter is drawn from the promontory of the sacrum to the middle of the top of the symphysis and measures 11 centimetres. Strictly speaking, this is sometimes called the anatomical rather than the obstetrical conjugate, since the posterior surface of the symphysis curves in slightly from the top and the point nearest the sacrum is a little below the top of the symphysis. It is from this point that the true obstetrical conjugate is taken, or would be taken if possible. It measures 10.5 centimetres.

The transverse diameter of the brim at its widest part measures 13 centimetres.

The right and left oblique diameters are taken, the former from the right and the latter from the left sacro-iliac synchondrosis, each extending to the *iliopectineal* eminence of the opposite side.

The Pelvic Outlet.—Although the cavity comes next in chronological order, it is best first to describe the outlet, since we can only define the

cavity as the space between the inlet and outlet. It is bounded by the pubic arch in front, the tuberosities of the ischia below, and the spines of the ischia behind. It has two principal diameters, the anteroposterior, from the middle of the subpubic arch to the tip of the coccyx, 9.5 centimetres which, however, is increased to 11.5 centimetres when the coccyx is bent backward, and the transverse, which is taken from one ischial tuberosity to the other, and measures 11 centimetres.

It must be admitted that, as we view the bony skeleton, what is called the pelvic outlet does not look like an outlet at all. It is necessary to reconstruct, in imagination, the birth canal, by "filling in" the soft parts. These soft tissues, made up chiefly of the levator ani muscle, complete the lower segment of the birth canal and help to constitute its true outlet. It is only in certain cases of pelvic contraction that the so-called outlet is really an outlet in the ordinary sense of the term. The reader will note also that it is almost round, and that, contrary to the opinion formerly held, there is little difference between its anteroposterior and transverse diameters.

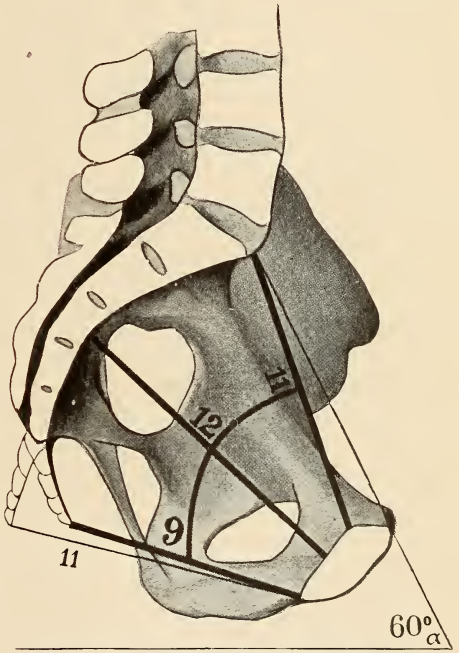


FIG. 72.—Sagittal section of normal pelvis.

The Pelvic Cavity.—The pelvic cavity is the space between the inlet above, the outlet below, and the anterior, posterior, and lateral walls of the pelvis. Of course, if we disregard the soft parts, it is not really a cavity; but there is no other word that will take its place. Anything, usually of course, the fetal head, that is between the inlet and the outlet is said to be in the cavity. In normal cases the anteroposterior diameter of the pelvic cavity, *i.e.*, the distance from the middle of the posterior surface of the symphysis to the middle of the concavity of the sacrum is 12 centimetres, while its transverse diameter taken from one ischial spine to the other is 10.5 centimetres.

When we recall that the plane of the inlet looks downward and backward and that of the outlet upward and forward it becomes obvious that the pelvic canal, and still more the birth canal, in which the soft structures are added, must be a curved canal. But it is not a symmetrically curved canal, like the traditional one of Carus. In other words, its axis is not a segment of a circle. As is well shown in Fig. 74, the axis of the superior strait is

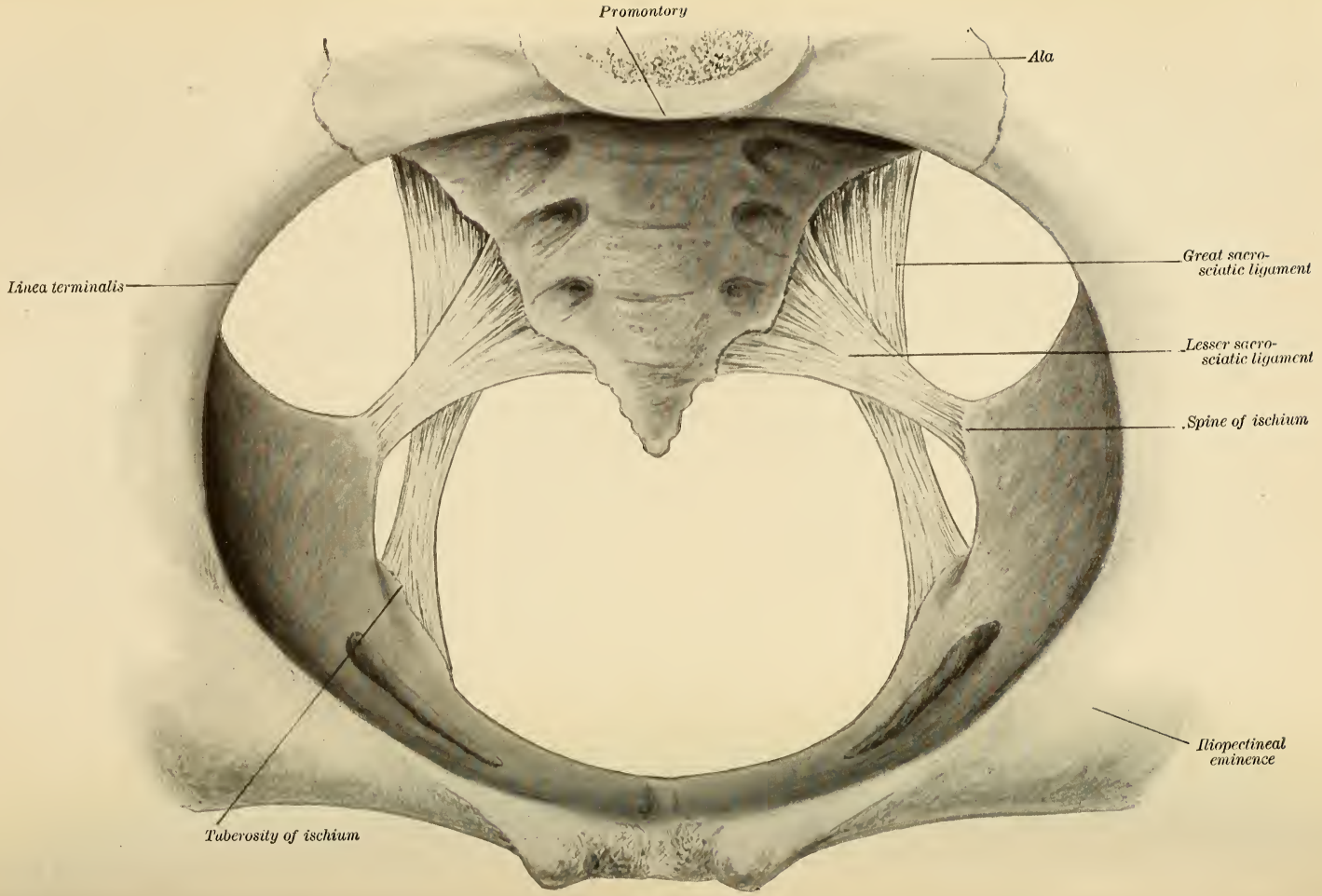


FIG. 73.—True pelvis, life size.

practically a straight line until, or almost until, it meets the plane of the outlet. This is proven clinically, as I have often remarked in using the Tarnier forceps, by the fact that traction is almost in a straight line until the head has reached, or almost reached, the floor of the pelvis. The correct line of the pelvic axis was realized by Hodge many years ago, but his ideas have been slow in finding acceptance.

The matter is obviously one of great practical importance. For example, if we really believed that the pelvic axis corresponds to the traditional curve, and in the course of a forceps operation should raise the handles of the forceps long before the head had reached the pelvic floor, we would never succeed in accomplishing delivery at all.

The Soft Parts.—What have the soft parts to do with the pelvic canal? Very little except at the outlet, and here a great deal. In primiparæ

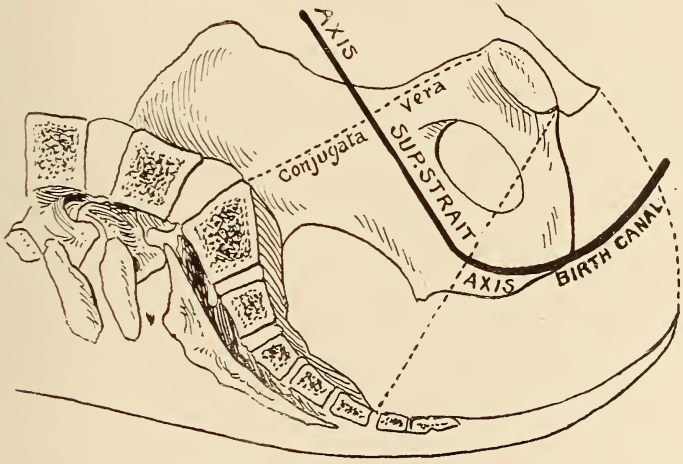


Fig. 74.—Diagram showing pelvic axis. (After Williams.)

the head is low in the pelvis long before labor begins and if no outlet exists, the second stage, much longer than in multiparæ, is entirely devoted to overcoming the resistance of the soft parts. How this resistance is overcome we will consider directly.

It is a matter of clinical observation that, other things being equal, labor is more difficult in very stout women and perhaps in those of great muscular development, *e.g.,* in athletes, but even in these cases the difficulty is chiefly at the outlet.

The Masculine Pelvis.—What are the principal points of difference between the male and the female pelvis?

In the male the pubic arch is much longer and narrower. The transverse diameter of the brim is diminished and its shape is round, rather than oval. The pelvis as a whole is deeper and more funnel-shaped and the measurements of the outlet are much smaller.

The Pelvis of Infancy.—In the new-born the vertebral column forms, with the sacrum and coccyx, what is approximately a straight line. The promontory is much higher, its width less, its lumbosacral portion much less convex, and not encroaching upon the pelvic cavity, while its pelvic inclination is from seventy-five to eighty degrees, as compared with fifty-five to sixty degrees in the adult female. The sacrum is flat transversely, instead of concave as in the adult, and is relatively small. The whole pelvis is relatively smaller and approximates the funnel type and the iliac tuberosities are nearer each other than the spines, the reverse being the case in the adult. The iliac bones are relatively much smaller and form, with the iliopectineal line, an angle of one hundred and fifty-five degrees, as opposed to one of one hundred and twenty-five degrees in the adult.

Divergence of type may be recognized in the fetal pelvis as early as the fourth or fifth month of intra-uterine life; and yet the characteristics of the female pelvis in the new-born are still predominantly masculine. The subsequent changes which are necessary to convert the pelvis into the true feminine type continue through childhood, and, as we shall see later, are apparently the result of the everyday occupations, pursuits, and exercises of child life.

Speculation as to the cause of the differences between the male and the female pelvis has thus far been futile. It is easy to explain why the pelvis of childhood should undergo certain changes as the result of standing, walking, sitting, etc., changes which will be discussed when we come to study pelvic contraction, but why these changes should differ with the sex of the individual is one of those riddles of organic life which, in the present state of our knowledge, defies solution.

The Pelvic Joints.—The pelvic joints are not immovable synchondroses but joints in the true sense of the word. At least this has been proven by Luschka in the case of the sacro-iliac articulations, while Budin showed long ago that there is considerable motion at the symphysis during the latter part of pregnancy. This he did by introducing his finger into the vagina and causing the patient to walk, thus recognizing the up-and-down movements of the pubic bones upon each other (Fig. 75).

The movement at the sacro-iliac joints has been demonstrated by Walcher's employment of the *Hängelage,* or hanging position, in which the patient is brought to the edge of the table, the ischial tuberosities resting upon its edge, the legs and thighs hanging over. The weight of the latter drags the symphysis directly downward and the rotation of the innominate bones upon the sacrum increases its distance from the sacrum by about one centimetre, as shown in the accompanying diagram. Of course this could only be the result of the rotation of the ossa innominata upon the sacrum. Of the Walcher position I shall speak again in connection with the subject of contracted pelvis (Fig. 76).

The Fetal Head.—As we have already seen the fetal head is relatively

very large. It presents a greater bulk than any other part of the fœtus, and is consequently the greatest obstacle to delivery.

The pelvis must be traversed by the fetal head. Neither the fetal head nor the pelvic cavity is symmetrical. The process is one of accommodation. It is necessary for us to acquaint ourselves with the size and shape of the fetal head and with the length of its various diameters, since

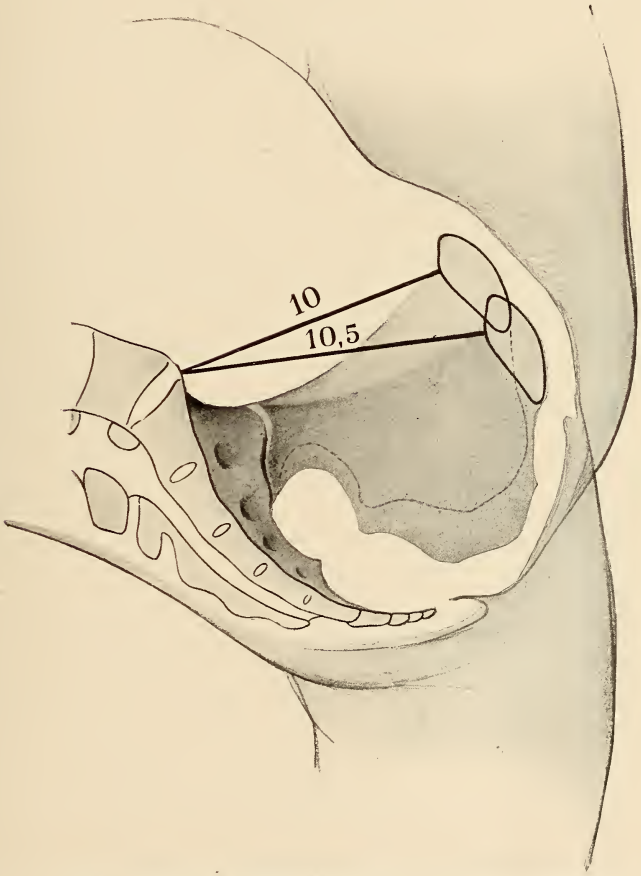


FIG. 75.—Change in length of conjugate diameter upon maximum stretching of pelvis.

it is plain that only by the adaptation of its smallest diameters to the largest diameters of the pelvic canal can the best results be obtained.

The fetal head is divided into the cranium and the face. The cranium is again divided into the vault and the base, the whole forming an irregular ovoid (Fig. 77). Note the small size of the face in proportion to the cranium. Note also that, in man, the cranium is much larger than in any other of the higher mammals, an honor for which the penalty must be paid in difficult labor.

Fortunately for the mother, the fetal head is not covered by a compact and solid bony layer as is that of the adult. The different bones that compose the skull have not yet been welded into one. They are still, as in the prenatal state, soft and malleable, and are still separated from each other by fibrous connections. Between the bones run lines of division which can be both seen and felt, and which permit an overlapping of the bones, and a consequent reduction of the size of the head. These are the sutures. At the junctures of the sutures are the fontanelles. The sutures are bands of fibrous union, the fontanelles are fibrous apertures at the union of three or more sutures.

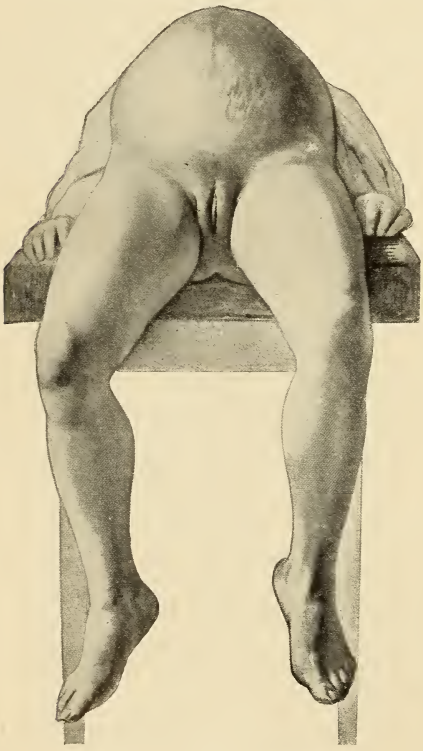


Fig. 76.—Walcher's position.

The Sutures and Fontanelles.—The sutures that interest us are the following:

The sagittal suture between the two parietal bones.

The frontal suture, between the two, as yet, ununited halves of the frontal bone.

The coronal suture, between the frontal and parietal bones on each side.

The lamboid suture, between the occipital bone and the two parietals.

The fontanelles are six in number:

The anterior or large fontanelle, also called the parietofrontal.

The posterior, or small fontanelle.

The lateral fontanelles, two on each side, otherwise known as the pterion and the asterion, or the anterolateral and posterolateral fontanelles.

The anterior fontanelle is formed by the junction of the sagittal, frontal, and two coronal sutures. It is a land-mark of great diagnostic importance. It is distinguished by the fact that from it radiate four sutures, that it is large and soft, and that it is never closed, even when the head is compressed during the progress of labor.

The posterior, or small fontanelle, is formed by the junction of three lines of sutures, the sagittal and the two branches of the V-shaped lamboidal suture. During labor, after the membranes have ruptured and the head is subjected to pressure, there is really no fontanelle in this location, but rather a triangular depression indicating the pushing of the occipital under the two parietal bones. On each side of this depression is a ridge, marking

one lateral half of the lamboidal suture, while from the intersection of these ridges can be traced the sagittal suture.

The anterolateral fontanelle at the end of the frontal suture is too

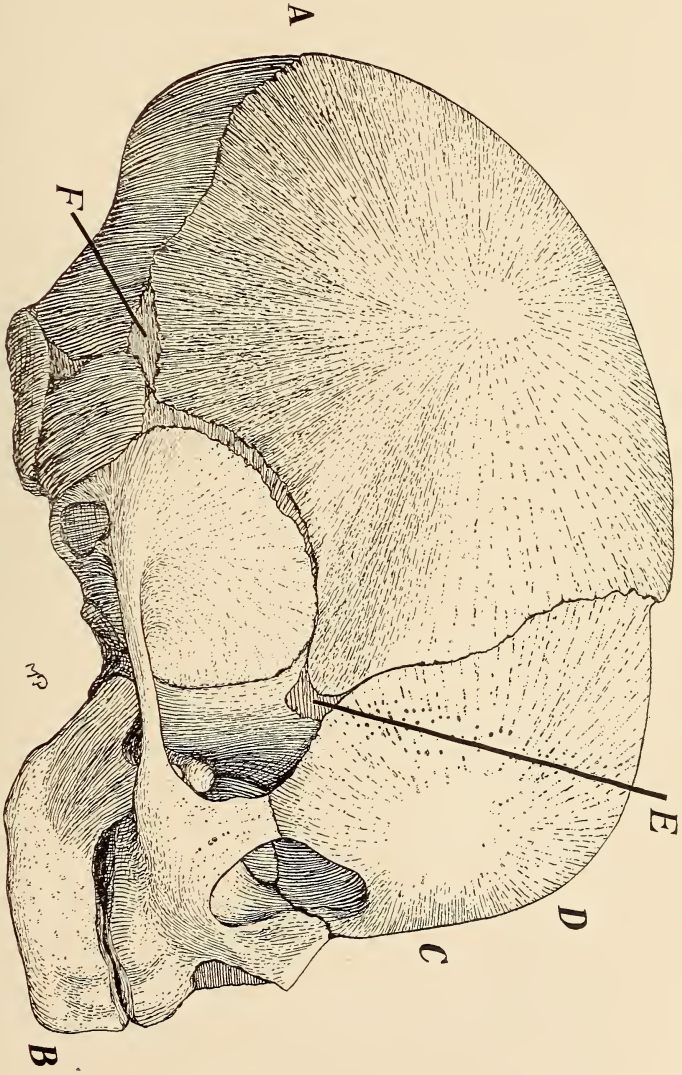


FIG. 77.—Fetal head, side view. Actual size. *A-B*, occipitomental diameter; *A-C*, occipitofrontal diameter; *D-B*, frontomental diameter; *E*, fonticulus Gasseri anterior; *F*, fonticulus Gasseri posterior.

deeply situated for recognition and is therefore of no clinical importance. The posterolateral, however, at the junction of the temporal, occipital, and parietal bones, may by reason of its three diverging sutures be mistaken for the posterior fontanelle.

The dimensions of the fetal head are usually expressed in what are called " diameters," though as the reader will note, they are not diameters in the strict sense of the word since they do not pass through the centre of the head.

The following are the diameters which we need to remember, with the approximate length of each.

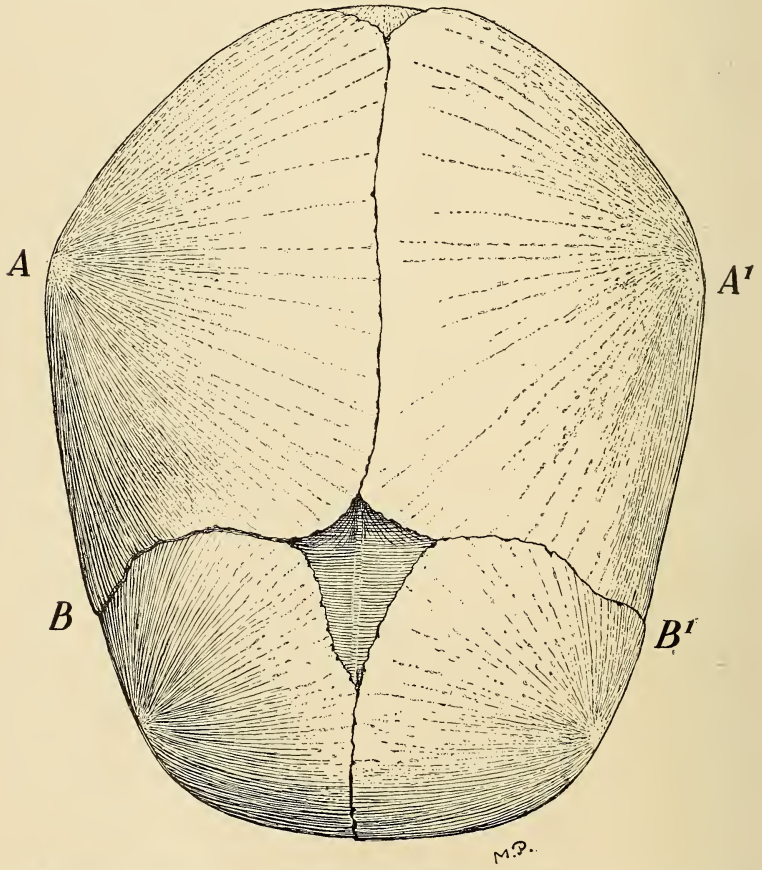


FIG. 78.—Fetal head, from above. Actual size. A-A^1, biparietal diameter; B-B^1, bitemporal diameter.

The occipitofrontal diameter or the greatest distance between the forehead and the occiput, 12 centimetres.

The biparietal or the greatest distance between the parietal eminences, 9¼ centimetres.

The bitemporal diameter or the greatest distance between the lower ends of the coronal suture, 8 centimetres.

The occipitomental diameter, 13½ centimetres.

The suboccipito bregmatic diameter, from the base of the occiput to the anterior fontanelle, 9½ centimetres (Fig. 79).

It is more important to recall the relative length of the various diameters than the exact length of each one. To know, for example, that the suboccipito bregmatic diameter, which is the diameter of engagement when the head is well flexed, is considerably shorter than the fronto-occipital, which presents when the head is not flexed at all, not only helps one to understand the mechanism of labor but suggests a rational treatment (Figs. 80 and 81).

It is customary to construct in the imagination certain planes corresponding to the various diameters. Thus we have the suboccipito breg-

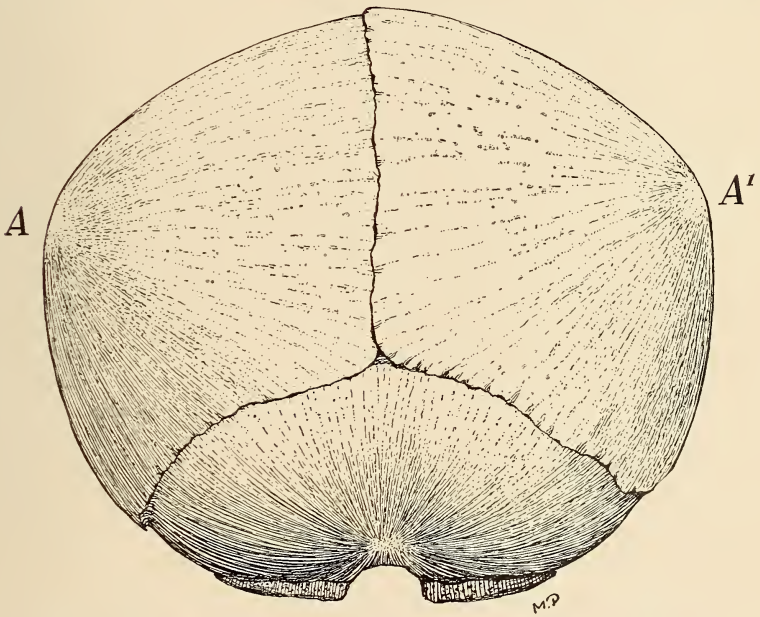


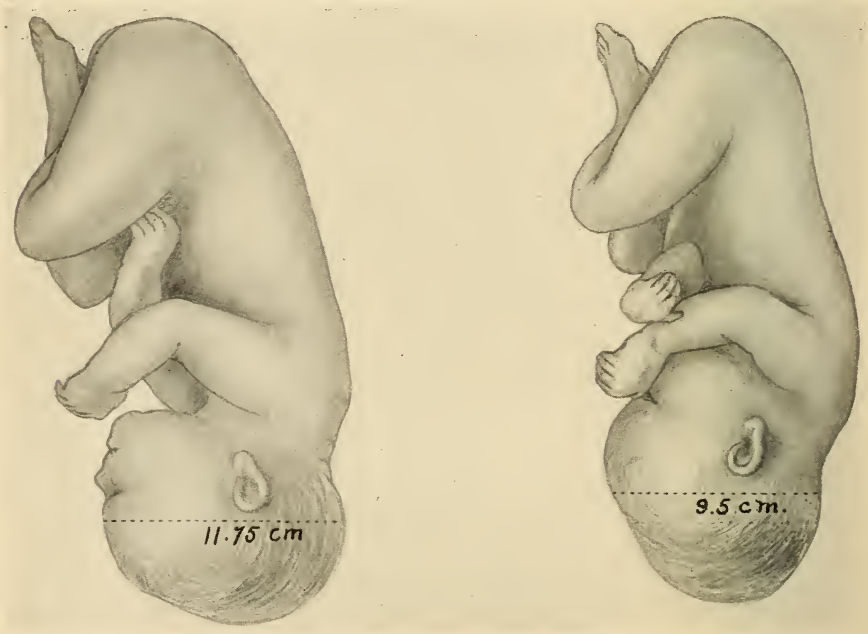
Fig. 79.—Fetal head, from behind. Actual size. A-A^1, biparietal diameter.

matic plane, the smallest of the planes that are likely to engage in some part of the birth canal, the one which does engage in normal delivery, and various other planes of larger diameters whose engagement is less favorable. It is hardly necessary, however, to multiply the number of these planes as was formerly customary and is still done by some writers. To my mind it is unwise to introduce any more mathematics into the subject than is absolutely essential. If a diameter is large, the corresponding plane is also large, and it hardly seems necessary to support this obvious fact by geometrical demonstrations.

The loose, fibrous union of the bones of the fetal skull is of great practical advantage in that it permits overlapping of the bones, and with

a resulting diminution in the size of the head and particularly of the presenting part. As we shall see later, this is especially marked in cases of pelvic contraction. Some little overlapping of the occipital bone by the parietals often occurs in normal labor.

Overlapping of the bones, however, is not the only factor that serves to diminish the size of the presenting part. So malleable are the bones of the fetal skull, owing to the fact that they are not as yet completely ossified, that during labor they become configured or moulded to fit the canal through which they must pass. This moulding is noticeable in all



FIGS. 80–81.—Diagram showing effect of flexion, conversion of occipitofrontal into suboccipito bregmatic diameter. (After Williams.)

vertex presentations unless labor is very easy. It is, of course, absent in cases of breech delivery and of Cæsarean section.

The size and compressibility of the head vary widely with the age of the fœtus. This is a fact seldom emphasized but of the greatest importance. The head of the premature fœtus is not only much smaller but much softer and more compressible than that of the fœtus at term. On the other hand, when pregnancy is prolonged beyond its usual limit, the head is often found to be not only much larger than usual but also much less compressible. During the latter part of pregnancy the head grows by leaps and bounds, not only in size but in hardness, and the skull becomes not only much larger but much harder. The fontanelles become smaller,

the sutures narrower, overlapping of the bones is limited, and moulding much less easy. This accounts for the great difficulty in delivery sometimes experienced when the patient has "gone over her time."

The Physiology of Labor

Just as the contents of any hollow viscus are expelled by muscular contraction so are those of the uterus. The muscles that are brought into play are first and most essentially those of the uterus. These muscles are beyond the control of the patient. She has no power to initiate or continue their contraction. They are indispensable to the beginning or the continuance of labor. They act mostly during the first stage but may act at any stage. Their chief function is to bring about dilatation of the cervix.

But the analogy does not end here. Just as the emptying of the rectum or bladder may be aided by the contraction of the abdominal muscles, so may the emptying of the uterus. In either case the muscles are those of the diaphragm and the abdominal wall. They are to a large extent under the control of the patient. Their action is highly important but not absolutely indispensable. They act only during the second stage of labor and their chief function is the propulsion of the fœtus.

The rôle then that is played by the involuntary muscles is by far the most important. It continues, or may continue, during the whole course of labor. Without it the process would never be naturally completed.

The rôle of the voluntary muscles, though often of great importance, is a minor one. It is not absolutely necessary to the completion of labor.

THE CAUSE OF LABOR

The expulsion of the uterine contents then is the result of muscular contractions. But such contractions have been going on since the beginning of pregnancy and are easily demonstrated during the latter months. Why have they not resulted in the expulsion of the fœtus at an earlier period of pregnancy? In other words, What is the cause of labor?

The student need not fear that he will be asked this question upon examination. The examiner himself does not know.

Since the dawn of medical history there has been much speculation upon this point. Hippocrates believed that the child is driven from its uterine shelter by the pangs of hunger. Many theories advanced since that time have had little more probability.

The onset of labor has been attributed to the periodical congestion which attends the menstrual epoch and which is thought to continue throughout pregnancy, occurring at those periods when the patient would menstruate if she were not pregnant. The ordinary date of labor is taken to correspond with the tenth menstrual period.

Other causes that have been advanced are uterine distention, fatty degeneration of the decidua, pressure upon the cervical ganglia, excess

of carbon dioxide in the maternal blood, heredity, or more properly speaking, natural selection, and anaphylaxis, etc. To discuss them all would serve no useful purpose here.

Personally I do not believe that there is any distinct line of demarcation between pregnancy and labor. The cervix is softened and in many cases considerably dilated by the painless contractions that go on during the latter weeks of pregnancy. As Bayer has aptly remarked, there

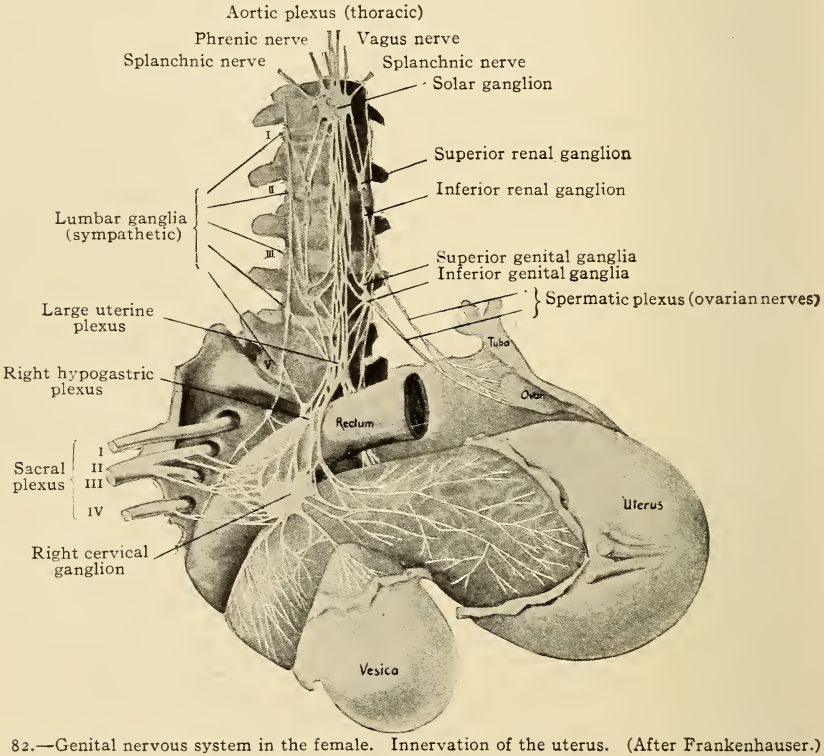


FIG. 82.—Genital nervous system in the female. Innervation of the uterus. (After Frankenhauser.)

is no difference between the contractions of pregnancy and those of labor, except that the latter are attended by pain. I have several times demonstrated, by vaginal examination, that there is tension of the amniotic sac during the contractions of pregnancy long before the beginning of true labor.

If it be asked, Why does labor fall upon the two hundred and eightieth day of gestation? the reply is, that we have no means of knowing that it does. Ahlfeld's tables showed a variation of three weeks, and every practitioner knows how unreliable are the usual methods of estimating the duration of pregnancy. The fact that the duration of pregnancy is approximately ten lunar months does not seem to require any more

explanation than that menstruation occurs every four weeks, or that puberty or the menopause corresponds to certain periods in the life of woman.

The Nervous Supply of the Uterus.—Of course uterine contractions, like other contractions, occur in response to nervous stimuli. Whence come the stimuli that cause the expulsion of the contents of the uterus?

The familiar dissections of Frankenhauser, which have been copied into nearly every text-book, still afford the best illustrations of the anatomical conditions, and for these the student is referred to the accompanying beautiful reproduction from Bumm (Fig. 82).

The nervous supply of the uterus is very complex, and many points in this connection are still unsettled. It is important to note the fact that the sympathetic system plays by far the most important part in the process of labor, and that, while motor impulses are transmitted to the uterus from the sympathetic system, sensory impulses come exclusively from the spinal cord. This is shown by the fact that when communication with the spinal cord is cut off, as in myelitis or paraplegia, labor is painless. It is also proven by the results of spinal anæsthesia and by experiments upon animals. Even when the spinal cord is completely severed labor may go on to a natural conclusion. This seems to show the existence of independent nerve centres, intrinsic uterine ganglia, which in some way as yet unknown give the first impulse to uterine contraction.

The reader should not fail to remark the relatively enormous nerve supply of the cervix. Noting this, it is easy to understand the fact that dilatation of the cervix is the most powerful impulse to uterine contraction, and to account for the extreme suffering that characterizes the approach of complete cervical dilatation.

It was formerly taught that there is in the medulla a special centre for uterine contractions but this has not been proven and is, antecedently, highly improbable. There can be no question, however, that the brain exercises, or may exercise, a regulating or inhibitory influence upon uterine action. Every nurse is familiar with the fact that the arrival of the physician sometimes "stops the pains" for a time, and every observant practitioner is familiar with the fact that, in the case of certain over-sensitive patients, the effect of fear is to inhibit uterine contraction and delay labor.

But to return to more practical considerations.

The uterine contractions are in the form of peristaltic waves beginning at the fundus and extending to the cervix. This has been definitely proven in the case of the lower animals, and reasoning from analogy is highly probable in man. The clinical history of these contractions will be considered presently. It is the clinical history of labor. Let us here consider briefly the mechanism by which they effect their object.

We must first recall the classical division of labor into three stages. The first stage lasts from the beginning of labor until complete dilatation

of the cervix has been attained. The second stage begins at this point and continues until the delivery of the child. With the delivery of the placenta and membranes the third stage is complete. If we would discuss the subject intelligently we must consider each stage separately.

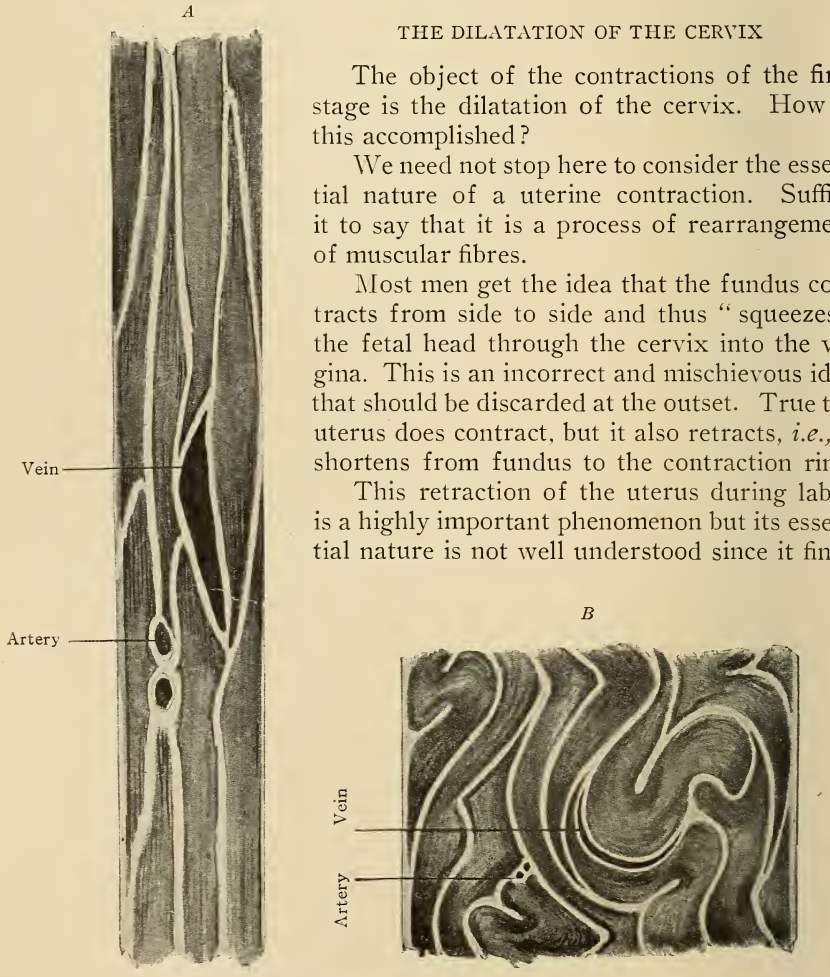


FIG. 83.—*A*, Arrangement of fibres in the gravid uterus; *B*, Rearrangement of the same in retracted uterus.

THE DILATATION OF THE CERVIX

The object of the contractions of the first stage is the dilatation of the cervix. How is this accomplished?

We need not stop here to consider the essential nature of a uterine contraction. Suffice it to say that it is a process of rearrangement of muscular fibres.

Most men get the idea that the fundus contracts from side to side and thus "squeezes" the fetal head through the cervix into the vagina. This is an incorrect and mischievous idea that should be discarded at the outset. True the uterus does contract, but it also retracts, *i.e.*, it shortens from fundus to the contraction ring.

This retraction of the uterus during labor is a highly important phenomenon but its essential nature is not well understood since it finds no exact parallel in the behavior of other muscular organs. We need not wonder at this when we recall the fact that skilled and unwearying investigators have not been able fully to understand or describe the complex arrangement of the muscular fibres of the uterus. Suffice it to say, that it is a process of rearrangement of the fibres. This is well shown in the

accompanying illustration from Bumm. Fibres that were end to end at the beginning of the process are side by side when retraction is complete. From this it results that after the emptying of the uterus the thickness of the uterine wall has been enormously increased (Fig. 83).

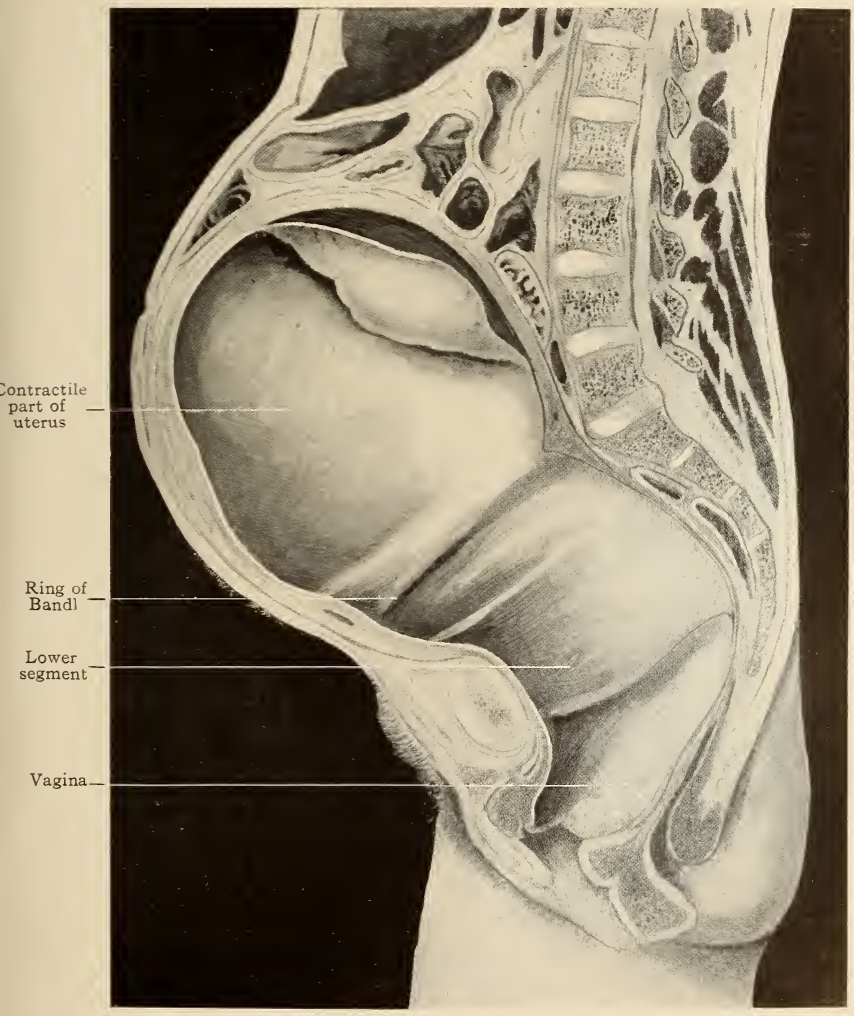


FIG. 84.—Showing changes in uterus at the end of period of dilatation.

What we need now is not to understand this process, but to remember it. The latter is absolutely necessary to any rational comprehension of the physiology of labor.

When the uterus contracts it does not compress its contents equally

and uniformly above, below, and on all sides. If this were the case all progress would soon cease and the uterus would be exhausted or ruptured by unavailing effort. There is a break in the continuity of the uterine cavity—the internal os. Into the circular fibres that constitute the bulk of the internal os are inserted the longitudinal fibres of the body of the uterus. These fibres exert an eccentric pull upon the os which gradually effects its dilatation and draws it up over the presenting part. *The head is not pushed through the cervix. The cervix is drawn up over the head.* With the retraction of the uterus the upper part becomes thicker, and with the ascent of the contraction ring the part below it becomes distended and thinned.

Thus, toward the end of the first stage, the uterus becomes divided

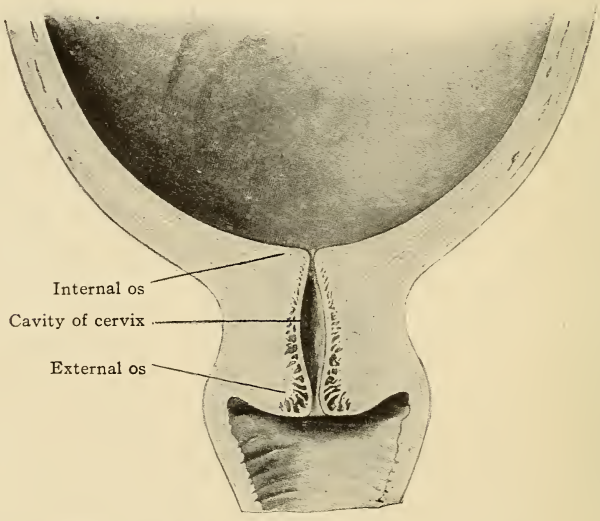


FIG. 85.—Cervix of a primipara at beginning of labor.

into two parts: an upper, thick, contracting and retracting part, bounded below by the contraction ring, a muscular ring, especially prominent posteriorly; and below this a thinned and distended portion, the lower uterine segment and the cervix (Fig. 84).

In primiparæ the cervix is gradually flattened out from above downwards, the internal os being first obliterated and then the external. In multiparæ, however, the resistance of the external os has been overcome in previous labors, and the internal is the only obstacle interposed by the cervix.

The "Bag of Waters."—But uterine contraction is not the only factor in overcoming the resistance of the cervix. Another and a very important factor is the dilating pressure of the lower segment of the amniotic sac, the "bag of waters," as it is called in the quaint phraseology of the lying-in

chamber. As soon as the cervix has dilated to any extent some of the amniotic fluid finds its way in front of the head, and the pouch thus formed is driven by each succeeding contraction into the resisting ring of the internal os, and becomes a powerful ally in the production of cervical dilatation. How necessary this hydrostatic dilatation of nature is to the progress of labor is shown by the fact that in cases of premature rupture of the membranes, or "dry labor," as it is called, with which we shall have to do later, much delay and difficulty are encountered (Fig. 87).

"The bag of waters" acts not only as a dilator, but by its mere presence in the cervix, as a reflex excitant of uterine contractions. We have already referred to the rich nervous supply of the cervix and, when we come to the study of obstetric surgery, we shall see how the mere

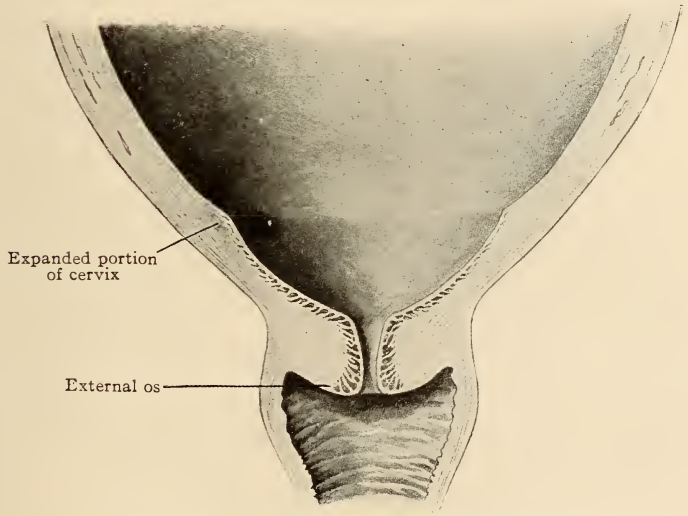


FIG. 85.—Primipara. Period of dilatation. Upper half of cervix unfolded.

presence of a rubber bag in the cervix is sufficient to excite uterine contraction and to usher in all the phenomena of labor.

Normally the head fills the pelvic brim and acts as a ball valve to prevent the overfilling of the presenting pouch of membranes. When, however, this is not the case, *e.g.*, in breech or shoulder presentation when the presenting part does not fill the brim, or in cases of contracted pelvis, when the brim is too small to admit the head, the fluid may escape past the head in large quantity, forming a long pouch like a great glove finger which projects, through the half dilated cervix, into the vagina. Indeed, this is an important diagnostic sign of pelvic contraction (Fig. 88).

In rare instances the membranes do not rupture at all, and the child is born surrounded by the unruptured amniotic sac. According to tradition, this is of favorable omen and augurs well for the future of the child.

The sac or "caul," as it is popularly called, has been preserved in many a household.

Not every discharge of fluid from the vagina, however, is a real "rupture of the membranes." In some cases there is a collection of fluid between the amnion and the chorion, the *Amniochorialis Wasser* of the Germans. Again, a watery discharge may be the result of the rupture of cysts that characterize certain forms of decidual endometritis. These two conditions serve to explain those cases in which we find the "bag of waters" still preserved, in spite of the fact that a watery discharge has taken place.

When complete dilatation of the cervix has been reached, the retraction

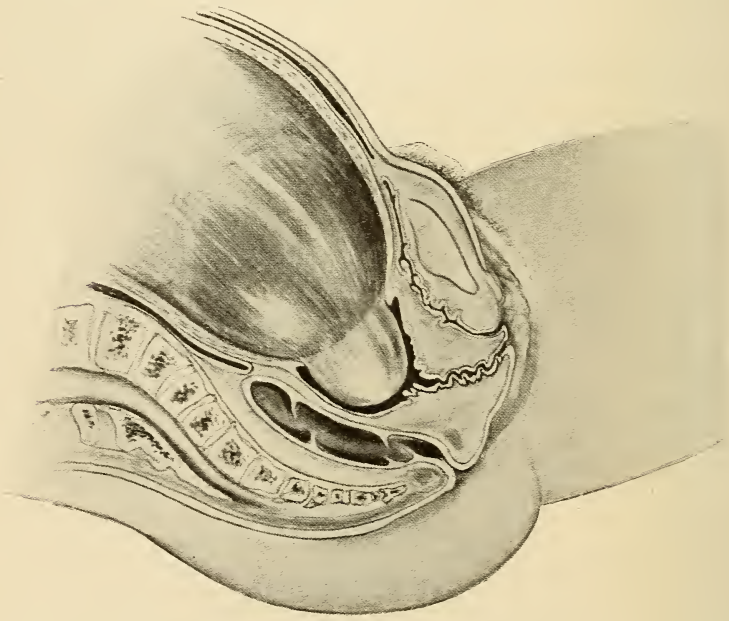


FIG. 87.—Cylindrical bag of waters.

of the uterus is, as a rule, also complete. The cervix cannot be stretched more and the round ligaments prevent the further ascent of the fundus. Hence all uterine pressure is exerted upon the fœtus. The barrier of the cervix has been removed and there remains no obstacle to the progress of the head, which now for the first time begins to descend. In the case of a multipara the head which, up to this time, has been above the pelvic brim, begins to descend into the pelvic cavity. In the case of a primipara the head, already in the pelvic cavity, descends to the pelvic floor.

But nature has set limits to the power of the uterine muscle. With the cervix fully dilated and the limit of retraction reached, something

else is needed to complete the parturient process. This is found in the contraction of the abdominal muscles. These are voluntary muscles and the patient is now able to help herself. Before this time bearing-down efforts have been useless or injurious. Now they are of service, and the more so as the head advances. But the contractions of the second stage are not entirely voluntary. As the head approaches the sensitive structures about the ostium vaginæ, the reflex stimulus to "bear down" becomes almost or quite irresistible. Some women, however, manage to resist this impulse and to delay labor for a long time.

With the delivery of the fœtus begins the third stage. We have now to consider the phenomena connected with the expulsion of the placenta.

During the contractions of labor the placental site diminishes in area,

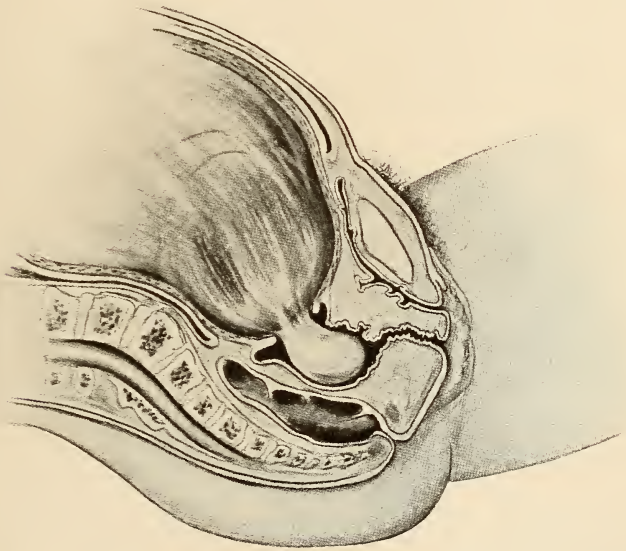


FIG. 88.—The amniotic sac projects into the vagina in a long narrow pouch. This happens when the head cannot descend, as in pelvic contraction.

as does the whole uterine interior. Before the rupture of the membranes, however, there is no permanent diminution. When the contraction is over, however, it resumes its original size, and thus it happens that before the rupture of the membranes there is no permanent reduction in the placental area and ordinarily no separation of the placenta. During the second stage and as a part of the general diminution in the size of the uterus which now occurs, the placenta becomes somewhat thickened and slightly folded upon itself, especially at the circumference, but there is as yet no separation.

After the delivery of the fœtus the uterus is so much reduced in size that the separation of the internal surface of the placenta is unavoidable.

The placenta has now become a foreign body, and lies unattached in the distended lower uterine segment.

A pause of variable duration now ensues after which the uterus again begins to contract, ushering in a second labor in miniature which results in the expulsion of the placenta. Owing to the fact that the distended lower segment has at this time little contractile power, expulsion may be long delayed and interference is often necessary.

How is the expulsion of the placenta accomplished? This is a disputed matter. Two methods are usually described: the mechanism of Duncan and

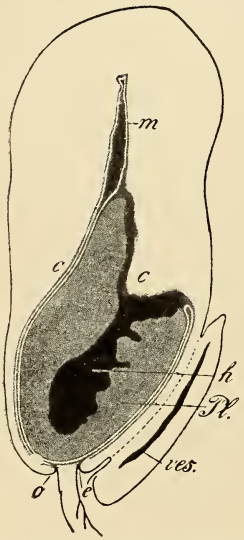


FIG. 89.—Expulsion of the placenta according to Baudelocque. (Pinard.) *o e*, external os; *c c*, contraction ring; *Pl.*, placenta folded together over the maternal surface; *h*, hæmatoma; *ves.*, bladder; *m*, membranes.

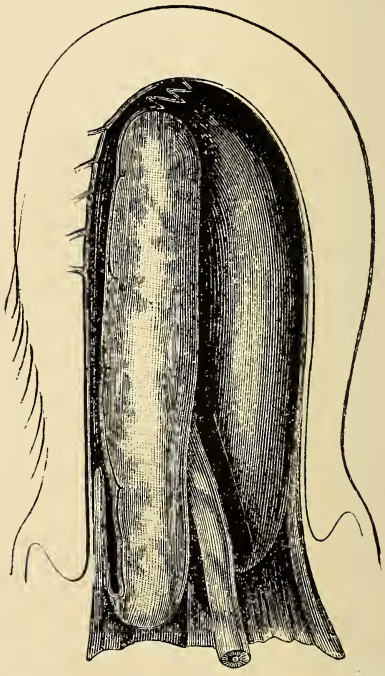


FIG. 90.—Expulsion of the placenta according to Duncan. (Charpentier.)

the mechanism of Schultze. The latter is, perhaps, more properly called the mechanism of Baudelocque, since it was described by the latter in 1789.

Mechanism of Baudelocque or Schultze.—Here the placenta presents at the vulva, by its fetal surface, the grayish-blue, glistening surface which soon becomes so familiar to those who have watched the process. It is the centre of the placenta, the most vulnerable part, which has separated first. Its periphery is still adherent. The blood which has escaped at the point of separation can escape no further and a large clot is formed—the retroplacental hæmatoma of Schultze—as it is usually called. There is no external bleeding.

Mechanism of Duncan.—Here the deep red, maternal surface presents at the vulva. The separation has been at the placental border. A moderate amount of blood escapes. There is of course no retroplacental hæmatoma. Nor is there the presenting pouch which is observed in the mechanism already described (Figs. 89 and 90).

What is the relative frequency of the two mechanisms? This is still a matter of controversy. In Germany opinion is divided. In England and our own country one hears more of Duncan's method. My own observation leads me to believe that the method of Baudelocque-Schultze is much more common. This is the conclusion of Fabre, who estimates the relative frequency of the two positions as five to one. It is probable that the mechanism of Duncan is, as Baudelocque said, an evidence of low insertion of the placenta.

The Mechanism of Labor

By the term mechanism of labor is meant the mechanical process by means of which the fœtus, under the influence of the natural expelling forces, is enabled to traverse the birth canal, and at length find its way into the external world. Variations from the typical mechanism are the cause of much trouble both to physician and patient, and their prompt recognition is absolutely necessary to intelligent prophylaxis or treatment. But we cannot recognize the abnormal unless we know the normal.

It is a strange and regrettable fact that so few students or practitioners remember even the normal mechanism. This is due, I think, in part to the fact that they are required to learn too much about it. The subject is usually made too complex by the discussion of ancient opinions and disputed theories, and by the inclusion of many statements of doubtful accuracy that have been handed down from one text-book to another. Moreover it is, in my opinion, a mistake to consider all parts of the subject, including the various kinds of abnormal mechanism at the same time.

Let us consider here the essential facts in connection with the mechanism of labor in occiput presentations. These make up the great majority of all presentations and these alone are to be regarded as normal. It is true that the posterior occiput sometimes refuses to rotate anteriorly and thus gives rise to trouble. This, however, is exceptional and abnormal and will be considered when we take up the subject of posterior positions of the occiput.

Other abnormalities of mechanism will be considered in connection with the various malpositions and malpresentations, and in discussing the subject of pelvic contraction.

I would strongly advise everyone who intends to practise obstetrics to commit to memory, and frequently to rehearse, the main facts in connection with the mechanism of normal labor. *When he knows the normal mechanism he will not be slow to recognize the abnormal.*

In the lower animals labor is comparatively easy on account of the

small and pointed head, which traverses the pelvic canal, and even the soft parts, with but little difficulty. In the human female most of the difficulty in delivery is caused by the disproportionately large head of the fœtus. It is only in rare cases that any other part of the fœtus, *e.g.*, the shoulders or the abdomen, offers a serious obstacle to delivery. Most of the problems connected with the mechanism of labor centre about the fetal head and its relation to the different diameters of the maternal pelvis, and to the birth canal as a whole, including the soft parts.

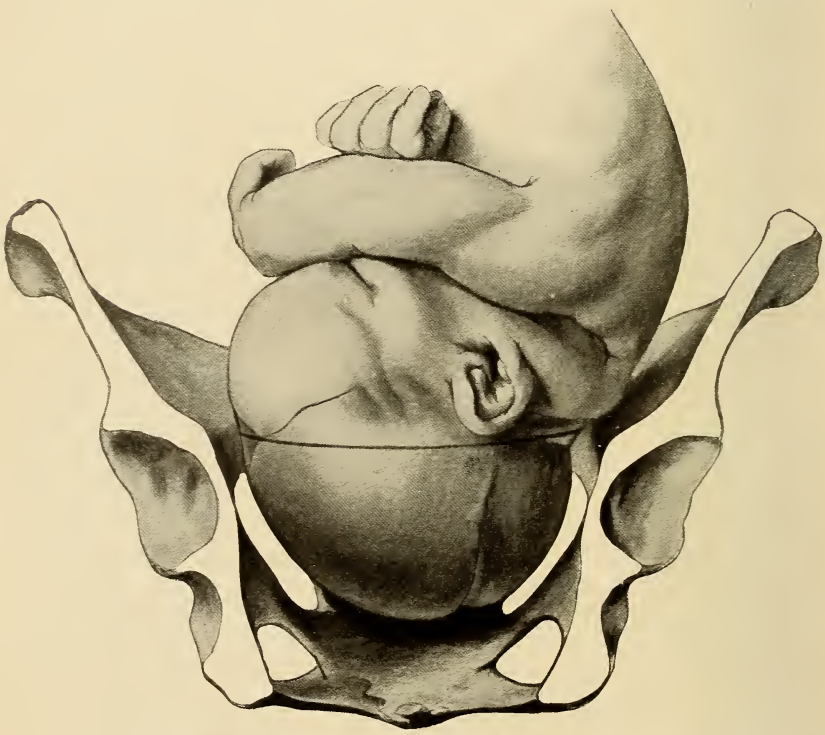


FIG. 91.—Primipara at beginning of labor. Head well flexed. Occiput fixed in pelvis.

To begin at the beginning, we must ask ourselves the question, What is the position of the fetal head at the beginning of labor? This question cannot be answered without qualification.

In multiparæ the head is above the pelvic brim, transverse or oblique, usually the latter, and only moderately flexed, or perhaps not flexed at all. In primiparæ it is in the cavity of the pelvis and well flexed. Many physicians do not seem to know this. Many text-books do not seem to notice it, or, at least, to emphasize it. It is a fact, however, that should never be forgotten, if one would understand the mechanism of labor. There are, of course, exceptions to this rule. For example, in the case

of a multipara with very little amniotic fluid, the head may be crowded into the pelvic cavity; again, if, in the case of a primipara, the pelvis is contracted, or the fetal head very large, the latter may be unable to enter the pelvis at all. Nevertheless, the rule is of very general application (Figs. 91 and 92).

Recalling these facts, the reader will understand at once that the mechanism of labor in multiparæ is very different from that which obtains

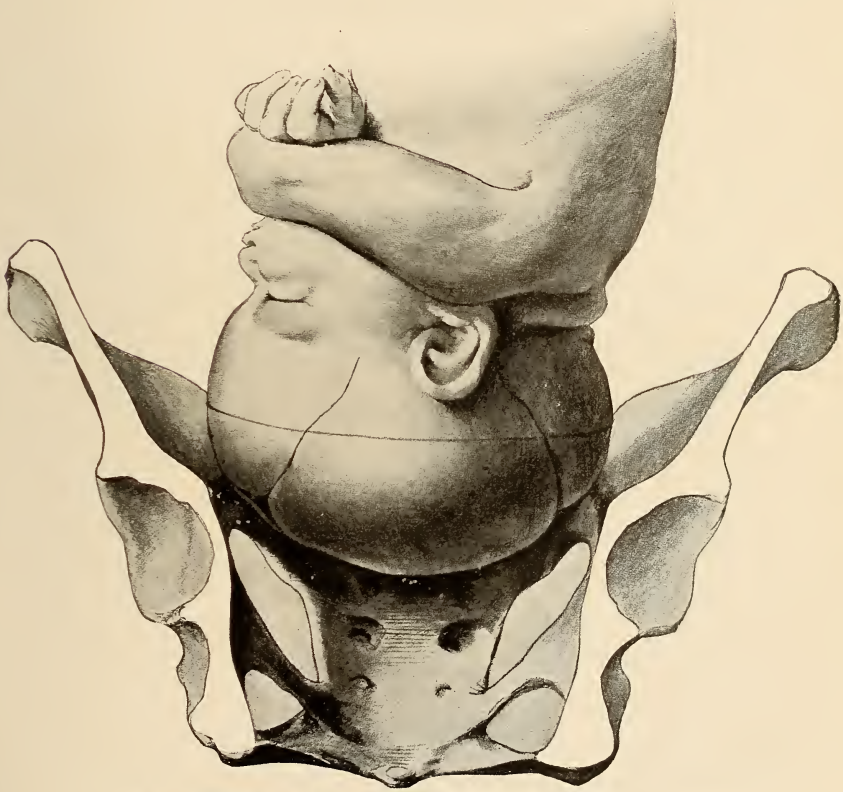


FIG. 92.—Multipara. Beginning of labor. Moderate flexion, still movable. Sinciput and occiput approximately at same level.

in primiparæ. In the latter, descent and flexion of the head occur long before the beginning of labor, while in the former the head usually remains above the brim, not only until the beginning of labor, but until the cervix has become dilated, the membranes have ruptured, and the first stage of labor is complete.

The movements of the head are denominated, according to ancient usage, as follows: Flexion, Descent, Rotation, Extension and External Rotation or Restitution. These terms are admirably clear and definite.

They explain themselves, and taken together, they tell in large part the story of the mechanism of labor. A single word of caution, however. These movements occur, not separately, but simultaneously. Thus the head does not first become flexed, then descend, then rotate, etc. Flexion and descent go on together, for example, and so may descent and rotation.

Flexion and Descent.—Let us then return to our multipara, in whom labor is about to begin. We will assume the position to be the usual left occiput anterior, the so-called L. O. A. position. Before rupture of the membranes, there has been little or no advance of the head, which remains above the brim in a position midway between flexion and extension. The long occipitofrontal diameter presents. The cervix has become dilated and the membranes have been ruptured. The expelling forces now have free play. Under their influence **descent** begins, but it is the occiput that descends first. In other words, **flexion** occurs. What is the cause of flexion? The propelling force is transmitted through the spinal column

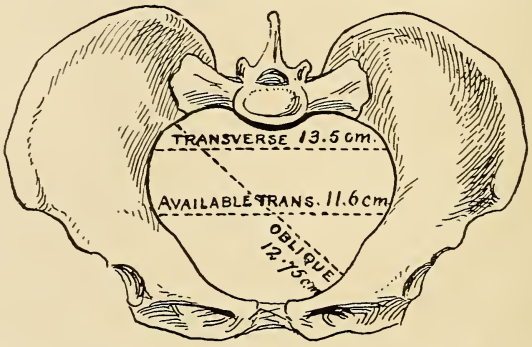


FIG. 93.—Shows why the head does not engage in the transverse diameter of the superior strait.

of the fœtus to the fetal head. But the spinal column does not articulate with the middle of the head. Its point of articulation is much nearer the occiput. Therefore, as soon as the anterior pole of the head comes in contact with the brim of the pelvis the head becomes flexed, the occiput descending in advance. When the greatest circumference of the head has entered the brim **engagement** is said to have occurred.

We have now learned the cause of flexion. What is its object? Plainly, the substitution of the short suboccipito bregmatic diameter, for the long occipitofrontal diameter which presented while the head was still above the brim. This substitution, of course, enables the head more easily to enter the pelvic brim, and more readily to traverse its subsequent course. As the head descends into the cavity of the pelvis it remains flexed, thus maintaining its smaller diameter and making descent more easy. Descent of the occiput as indicated by a low position of the small fontanelle is, except in cases of flat pelvis, of favorable import.

But let us return a moment to the head, as it is about to enter the

brim of the pelvis. At first thought one would suppose that the head would enter transversely, but as a matter of fact it usually enters in one of the oblique diameters; in this case, of course, the left oblique. What is the reason for this? The projecting promontory of the sacrum prevents it from utilizing the transverse diameter. This is clearly shown in the accompanying illustration (Fig. 93).

Still another point with reference to the entrance of the head into the brim. It was taught by Naegele that the head enters the brim obliquely, the anterior parietal bone presenting, and the sagittal suture near the promontory, the so-called biparietal obliquity of Naegele. This is, it is

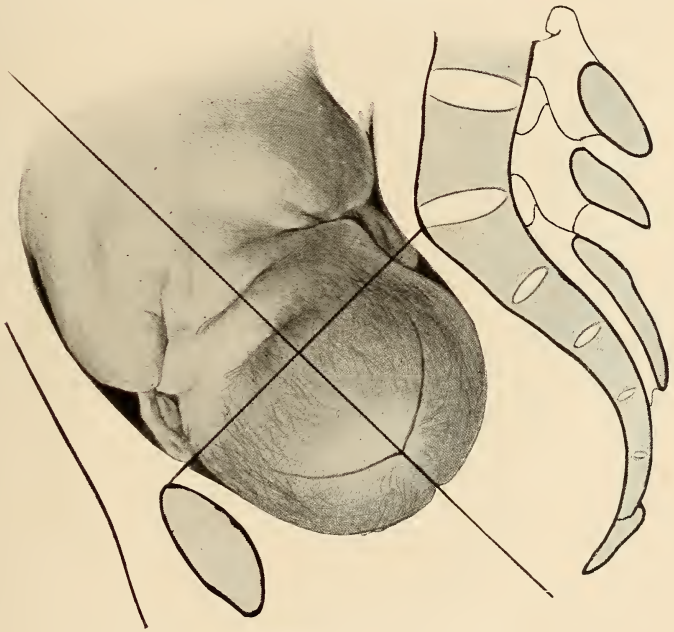


FIG. 94.—Synclitic or parallel entrance of head into pelvic brim.

true, frequently the case in contracted pelvis, or in pendulous abdomen, when the breech falls forward and the head points backward, but abundant observation has proven that in normal cases the head enters the brim of the pelvis directly, that is with the sagittal suture midway between the symphysis pubis and the promontory of the sacrum (Figs. 94, 95 and 96).

Rotation.—We have now seen how the head becomes flexed and enters the cavity of the pelvis. Under the influence of the same forces, descent continues and at the same time a new movement occurs; the movement of **rotation,** by which, as the head continues to descend, the occipital pole rotates to the front, until the head comes, at the outlet, to occupy the anteroposterior diameter, the occiput presenting beneath the pubic arch.

What is the cause of this rotation? A most interesting and important question.

Several theories have been advanced. In the first place, the pelvis is said to have a spiral or corkscrew form, its transverse diameter being greatest at the brim, while its anteroposterior diameter is greatest at the outlet. This is perhaps true if we include the soft structures of the pelvic floor, but if we regard the bony pelvis alone, it is little more than a time-honored fiction. If one looks at an articulated pelvis, it requires a vivid imagination to discover this corkscrew form, or to make out that

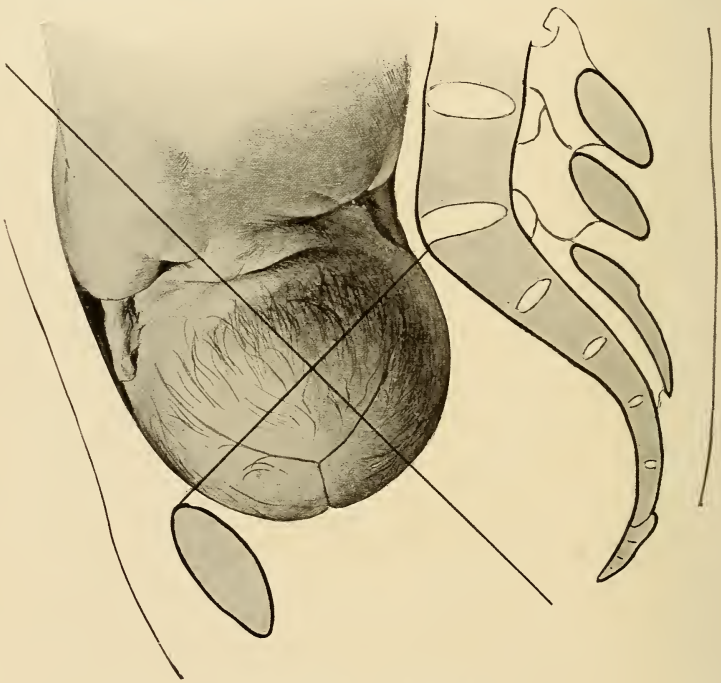


Fig. 95.—Posterior asynclitism.

the anteroposterior diameter of the outlet is much greater than the transverse.

Another alleged factor is the lessened resistance anteriorly at the subpubic arch. It is claimed that here the occiput rotates in the direction of least resistance.

Still another theory is that the thrust of the lateral pelvic walls, or pelvic planes, as they are often inaccurately called, determines the rotation of the occiput.

Sellheim has recently sought to explain the rotation of the occiput, as a species of accommodation of the fœtus to the pelvic canal. The back of the neck, the point at which the greatest bending of the fetal body is

permitted, must come into contact with the subpubic arch, before the movement of extension of the head, which is absolutely essential to progress, can occur. DeLee has very aptly compared this to the movement which occurs when the foot, pointing "sideways," is pushed into a boot, the foot rotating as it advances until the curve of the ankle corresponds with the curve of the boot.

All these theories are, in my opinion, discredited by the fact that in many cases rotation does not occur until the head has reached the floor of the pelvis. It is the observation of every watchful obstetrician that, in

Fig. 96.—Anterior asynclitism.

multiparæ, rotation and expulsion are almost simultaneous. This leads me to believe that whatever effect the above mentioned factors may have in determining rotation the principle rôle is played by the soft parts.

The accompanying illustration (Fig. 97) shows the floor of the pelvis as viewed from above, and it is easy to see how the descending head becomes adapted to the anteroposterior gutter formed by the soft parts. Indeed it is difficult to see how it could do otherwise. It is also plain that rotation would occur earlier in the case of a primipara with tense, resistant, and intact pelvic floor, than in that of a multipara with lax and perhaps lacerated tissues; and this I have often found to be the case.

We have tried to show why the head rotates, but there remains an important question to be answered. Why does it rotate anteriorly? What is the provision of nature that saves the patient from a posterior position of the occiput with its attendant disadvantages? In my opinion the best answer to this question has been furnished by Ohlshausen, who believes that the head rotates anteriorly because its posterior rotation would be prevented by the fetal trunk which maintains the position which it occupied before labor, *i.e.*, with the back anterior. The reason for this anterior position of the back we have already considered.

When does rotation occur? At what point in the pelvis?

There is no fixed point. In primiparæ it usually begins in the mid-pelvis, though it may begin higher. In multiparæ, if the head is not over

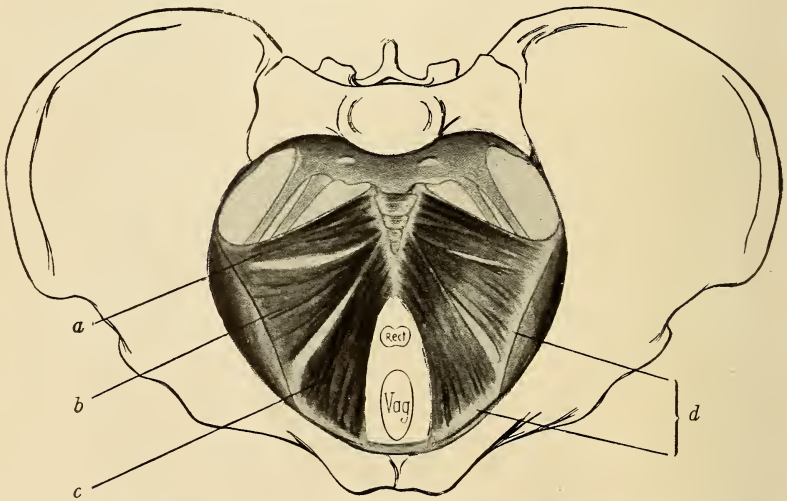


FIG. 97.—Pelvic floor, viewed from above. *a*, ischio-coccygeus muscle; *b*, iliac portion of the levator ani; *c*, pubic portion of the levator ani; *d*, arcus tendinus (Bumm).

large, it may, and often does, remain transverse until the last moment, rotating only when it is well down upon the pelvic floor.

The cause of rotation then is to be found chiefly in the soft structures of the pelvic floor. Its subject, of course, is to bring the occiput beneath the pubic arch so that the shorter suboccipito bregmatic diameter may be opposed to the scanty space afforded by the vulval orifice.

What is the degree of rotation? In anterior cases about one-eighth of a circle, as shown in Figs. 98 and 99. When the occiput is posterior the distance is about three-eighths of a circle; see Figs. 100 and 101.

All this time descent continues. When, however, the occiput becomes fixed under the pubic arch, the expelling forces continuing to act in the same line as before, *i.e.*, in the line of the pelvic brim, the back of the neck becomes firmly fixed against the inner aspect of the pubis, preventing further advance of the occiput. The propelling force is now expended

upon the frontal end of the head, and this can only result in extension by means of which the occiput, vertex, brow and face are successively made to emerge over the perineum in a manner too familiar to need description.

The movement of extension is materially aided by the upward pull of the distended and elastic perineum.

Following the delivery of the head the shoulders rotate into the anteroposterior diameter of the outlet, and the head, turning with them, assumes a lateral position, the occiput pointing in the direction of the side toward which it was originally directed, *i.e.*, in the L. O. A. position toward the left side, and vice versa. It is the shoulders that rotate, and

FIG. 98.

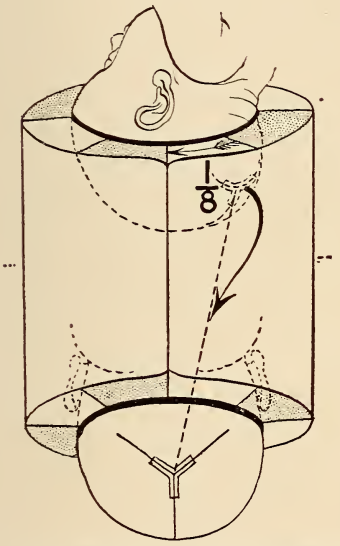


FIG. 99.

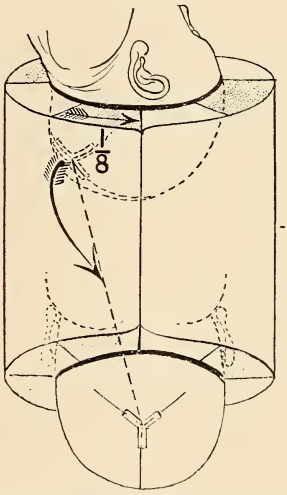


FIG. 98.—Position, L. O. A. Degree of rotation in anterior cases, one-eighth of a circle.
FIG. 99.—Position, R. O. A. Degree of rotation, one-eighth of a circle.

the head follows. This final movement of the head is known as external rotation or restitution.

Delivery of the Shoulders.—After the delivery and rotation of the head there is a short pause, during which nature seems to gather her energies for the little work that is left. Just how long this interval would last few of us know, for few of us have the "repose" to wait. When it is over, or when uterine action is started by pressure upon the fundus, the anterior shoulder descends and becomes fixed beneath the symphysis, very much as the occiput does before the delivery of the head. The propelling force continuing, the posterior shoulder sweeps over the perineum, as do the forehead and face after the delivery of the occiput.

Superrotation of the Head.—An occasional anomaly is the so-called superrotation of the head, which is really nothing more than superrotation

of the shoulders. For example, a head presenting in the L. O. A. position rotates under the pubic arch, but instead of stopping there, continues its rotation until it comes to occupy the R. O. A. position. If this occurs before delivery, as it sometimes does, it is usually overlooked; though if a careful external and internal examination were made, it would show the back directed toward one side and the occiput toward the other. This phenomenon is of no great clinical importance, but may lead the attendant, or, what is more embarrassing, some one else, to the mistaken assumption that his original diagnosis of the position was incorrect.

I cannot dismiss this subject without reference to a factor which has much to do with the mechanism of labor, but which is not usually mentioned in connection with the subject.

Fig. 100.

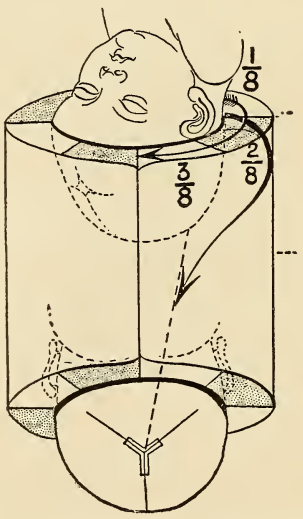


Fig. 101.

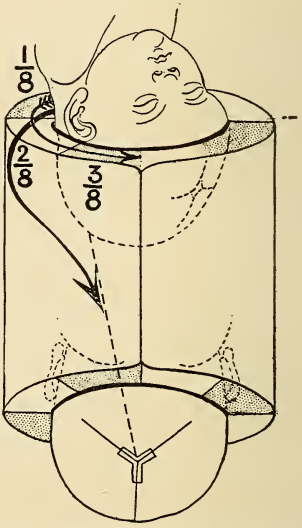


Fig. 100.—Position, R. O. P. Degree of rotation in posterior cases about three-eighths of a circle.
Fig. 101.—Position, L. O. P. Degree of rotation about three-eighths of a circle.

Fortunately the fetal head is not a hard, incompressible body like a glass ball. If it were we would meet with disaster in almost every case. The cranial bones are thin and flexible, and the sutures permit their free overlapping. Thus it happens that during labor, and especially when labor is long delayed, or when there is much disproportion between the head and the birth canal, as in pelvic contraction, or when the head is of unusual size or when, as in various malpresentations, it presents by one of the larger diameters, it becomes moulded to the canal through which it must pass. As we shall see later, this moulding is sometimes very marked and often enables nature to overcome obstacles that at first sight seemed impassable.

The head of the premature fœtus moulds almost like wax. This malleability becomes less as pregnancy advances, though it is sufficient at term to overcome considerable disproportion provided the uterine contractions are satisfactory. The heads of negro children are somewhat smaller and more malleable than those of the white race. Hence, although moderate pelvic contraction is common among negroes, their labors are usually easy.

The head, however, increases rapidly, not only in size but also in hardness, during the latter weeks of pregnancy. It is especially in cases in which the patient has gone a week or two over her allotted time that the head is very incompressible, and this fact helps to account for the great difficulty often encountered in these cases.

Let me entreat the reader not to neglect the study of the physiology and mechanism of labor. To attempt to memorize all that is sometimes written about it is folly. But every one should master the essentials. He will then understand the phenomena of labor as he never could understand them otherwise. He will find the study highly interesting in itself, and what is more important he will not fail to make practical application of his knowledge in the interest of those entrusted to his care.

CHAPTER VII

THE DIAGNOSIS AND CLINICAL PHENOMENA OF LABOR

Labor does not come suddenly, like a flash from a clear sky. There are certain well-defined warnings, not difficult to recognize, with which the practitioner, and, indeed, the patient herself, if she has been pregnant before, soon becomes familiar.

Premonitory Symptoms.—About three weeks before labor begins, the fundus uteri, which by this time has reached, or nearly reached, the xiphoid cartilage, sinks downward and somewhat forward, until it comes to occupy the position which it occupied four weeks earlier. This phenomenon is more marked in primiparæ. It is at about this time that in these cases the head becomes deeply engaged in the pelvic cavity. In multiparæ the forward movement of the fundus predominates, causing a somewhat pendulous condition of the abdomen. As we have already seen, the head in multiparæ usually remains above the brim until the beginning of the second stage of labor.

This sinking of the fundus, or "lightening," as it is sometimes termed by the laity, relieves certain symptoms caused by the upward pressure of the uterus, *e.g.,* dyspnœa and indigestion. In primiparæ, however, this is more than counterbalanced by the "bearing down" sensations, the difficulty in walking and the frequent urination that accompany the descent of the head into the pelvis. Another premonitory symptom, common at this time, is a marked increase of the vaginal secretion, which is sometimes a source of considerable annoyance to the patient. The painless contractions of pregnancy become more frequent and pronounced especially at night and in the early hours of the morning. Sometimes they closely simulate genuine labor pains and one has to wait a few hours before making a positive diagnosis. This brings us to an important question.

The Diagnosis of Beginning Labor

When does labor begin? What are the evidences that it really has begun?

Little attention is usually given to the diagnosis of beginning labor. This, I believe to be a mistake. Neither practitioner nor student knows by intuition what constitutes real labor. Stereotyped rules and didactic teaching often leave him in doubt. The symptoms of labor as usually given are pain and dilatation of the cervix, and yet both these symptoms may be present long before labor begins.

I recall a case that I saw with the students in the out-door department of a maternity hospital. It was reported as a case of delayed labor, and the students could not be blamed for following their text-books. Indeed,

according to the definition so often given, the patient was in labor, for she had both pain and dilatation of the cervix. Vaginal examination, however, showed that true labor had not begun and the pains were recognized as those indefinite and irregular pains so common in multiparæ. The students were relieved from further anxiety about the case, and the patient was not delivered until some weeks later.

The dilatation in this case was the usual dilatation of a multiparous cervix in the latter weeks of pregnancy. In these cases it is almost always possible to pass one or even two fingers, not only through the external, but through the internal os, long before the beginning of labor. At this time the cervix in a multipara has the shape of an inverted funnel. The external

FIG. 102.

FIG. 103.

FIG. 102.—Cervix of multipara before beginning of labor. Dilatation without effacement.
FIG. 103.—Cervix of primipara at beginning of labor.

os is larger than the internal. As long as this shape is maintained, the patient is not in labor, no matter how great the dilatation, or how severe the pain (Fig. 102). At the beginning of labor the internal os begins to soften and to dilate. The funnel is no longer inverted (Figs. 103, 104 and 105).

FIG. 104.

FIG. 105.

FIG. 104.—Cervix of primipara. Beginning effacement.
FIG. 105.—Cervix of primipara. Effacement complete. Beginning dilatation.

In primiparæ the external os is firm, and the canal cylindrical or spindle-shaped, rather than funnel-shaped. There is usually much less dilatation, the external os, as a rule, barely admitting the tip of the finger. Even here, however, there are numerous exceptions, and not infrequently the examiner will be surprised to find that one or even two fingers may be passed without difficulty through both orifices.

Dilatation, then, is not in itself evidence of beginning labor. It is the kind of dilatation that counts.

If one is called at an early stage of labor, *i.e.*, before obliteration of the cervical canal, labor may be suspected from the fact that the internal os is beginning to soften, and that it is larger than the external. Now and then in the course of an antepartum examination I have thus diagnosed beginning labor, although the patient had complained of no special pain. As a rule, however, by the time the physician is called the internal os has disappeared, the canal of the cervix has been obliterated, and all that one feels is the sharp edge of the external os.

There is usually little difficulty in determining the commencement of labor in primiparæ. As a rule, the cervix remains closed until labor begins, and by the time that dilatation is noticeable the other signs of labor are unmistakable. In those cases in which the canal is dilated before labor the diagnosis may be made in the manner already described. The student should have impressed upon his mind the fact so often ignored or unnoticed that the evidences of beginning labor are not the same in primiparæ as in multiparæ. With reference to prognosis he should remember that dilatation of the internal os is the diagnostic index of the progress of the first stage of labor in multiparæ as is dilatation of the external os in primiparæ.

It is no wonder that the modern medical student is sometimes bewildered. He will find in standard text-books the astonishing statement that the cervical canal remains closed until the very beginning of labor, and he is also told that dilatation of the cervix and obliteration of its canal are the chief objective signs of labor; but if he is an observant man and has opportunities for examination, he will find, to his surprise, that occasionally, in primiparæ, and, as a rule, in multiparæ, the cervical canal is dilated for its entire length to the point of admitting one or two fingers long before labor begins, and that, especially in multiparæ, obliteration of the canal usually means not only that labor has begun, but also that a large and, clinically, an important part of the first stage has been completed. Unless, however, he is taught these things at the outset of his practical work, he will learn them only as the result of many mistakes, much personal inconvenience and chagrin, and perhaps at the expense of the welfare of his patients.

The signs of labor then that are available for diagnosis, are the disappearance of the internal os, and the obliteration of the cervical canal. It is true that this condition, or something very much like it, is sometimes found in conditions of great distention, *e.g.*, hydramnion, or twin pregnancy, long before labor begins, but in these cases pain, if present, is indefinite and irregular. When the cervical canal is obliterated, and the patient has true rhythmical pains she is undoubtedly in labor.

The Contractions of Labor.—The advent of true labor, then, is marked by regularly recurring "pains." These are about twenty minutes apart, sometimes thirty minutes. At first they excite little or no attention, but as the hours pass they gradually increase in frequency and severity

until it is evident, even to those of little or no experience, that something unusual is in progress. The popular term "pain," as a substitute for contraction, has become so imbedded in the literature of the subject that it is difficult to separate the two words.

After all, the history of labor is the history of the contractions by which the uterus finally expels its contents. Let us consider these contractions somewhat in detail.

How do they begin? Sometimes suddenly; that is, the pain begins suddenly. As we have already seen contractions have been going on for months, but up to this time they have not been painful.

In other cases true labor has been preceded by days of discomfort, and the transition from pregnancy is so gradual that it is impossible to say when pregnancy stops and labor begins. My own belief, which I have expressed elsewhere, is that pregnancy and labor are one process, that there is no sharp line of demarcation between them, that contraction, not pain, is the essential element in labor, and that pain is a clinical not a physiological distinction.

However, we must have some clinical evidence of the beginning of labor. Ordinarily that evidence consists in the fact that uterine contractions that have hitherto been painless, become painful, and this usually coincides with beginning dilatation of the internal os.

In reading various descriptions of the process of labor one cannot but be impressed by the fact that most men have been content with superficial observation, and have described the pains or contractions, not as they have found them by careful study, but as, reasoning from analogy, they have thought that they ought to be. Most writers describe the contractions as increasing steadily in frequency, duration, force, and intensity from the beginning to the end of labor. Such descriptions are incorrect, and more accurate knowledge is essential if one would know the natural history of labor, and thus be in a position to recognize departures from the normal.

Frequency.—The first contractions are about twenty minutes apart. During the first stage, *i.e.*, up to the period of full dilatation of the cervix, they increase progressively in frequency, until the interval has been reduced from about twenty minutes to about three minutes. During the stage of expulsion they become somewhat less frequent, the interval being about five minutes. During the dilatation of the vulva, however, they become a little more rapid.

Duration.—The contractions of beginning labor are not more than five or ten seconds long, but their duration increases progressively up to the end of the first stage, when they may be a full minute in length. Their duration is not progressive however during the second stage. During this stage they are about twenty or thirty seconds in length, each complete contraction representing a group of two or three shorter ones, each about ten seconds in length (Fabre). Of course the pains seem much longer than they really are.

Location.—At first the pain is felt in the back or lumbar region and radiates, or as the patients often say "comes around," to the groins and lower abdomen. Later, however, the pain becomes localized in the suprapubic region, where it usually remains until the second stage is well under way. As the head approaches the pelvic floor the patient complains of a sensation of great pressure in the neighborhood of the perineum and rectum, while during the stage of expulsion the pain is referred to the orifice of the vagina.

Character and Intensity of the Pains.—The first pains are slight and are often regarded by the patient with interest and curiosity. At first

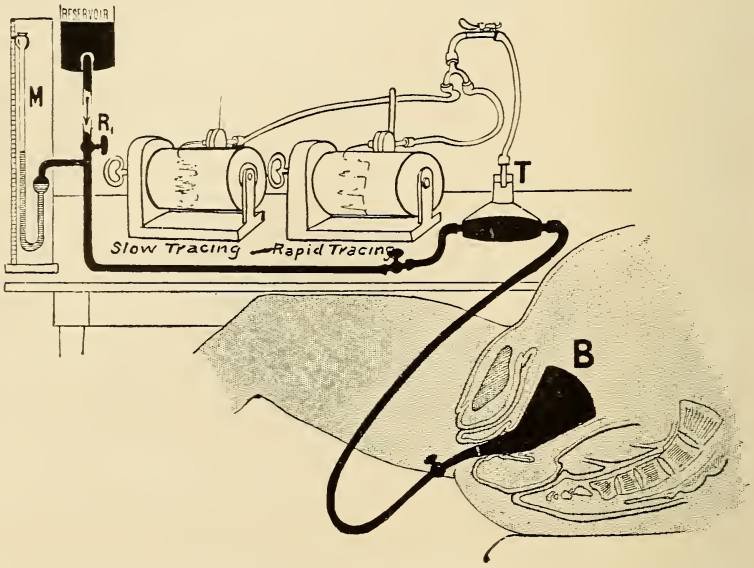


Fig. 106.—Method of internal hysterography. *M*, manometer; *R*, reservoir; slow tracing; rapid tracing; *T*, transmitter; *B*, de Ribes bag.

they resemble intestinal cramps for which indeed they are often mistaken. They increase progressively in severity, however, until the cervix is nearly or quite dilated. At this time they are very often severe, exceeding in intensity those of the second stage. The French writers have graphically described this part of labor as the *periode de désespoir*, and so it often seems.

As the head descends into the vagina, the great nerve ganglia about the cervix are to some extent relieved from pressure, and, as we shall see presently, the pains, though still severe, are better borne by the patient. As the head emerges from the vulva the pain again becomes acute, especially in primiparæ. Fortunately this stage is of short duration and we have means for its mitigation.

Force Exerted by the Uterine Contractions.—Various methods have been used in the attempt to estimate the pressure brought to bear upon the uterine contents during a contraction. One of these methods is to attach a manometer to a de Ribes bag introduced within the cervix. Another method is to stretch a segment of amniotic sac over the orifice of a tube ten centimetres in diameter, this being the average diameter of the cervix at the time of rupture of the membranes, and determine the force required to effect rupture. Still another method is to hold back the head, and estimate the force thus expended. As a result of these different methods it has been estimated that in normal labor the force varies between

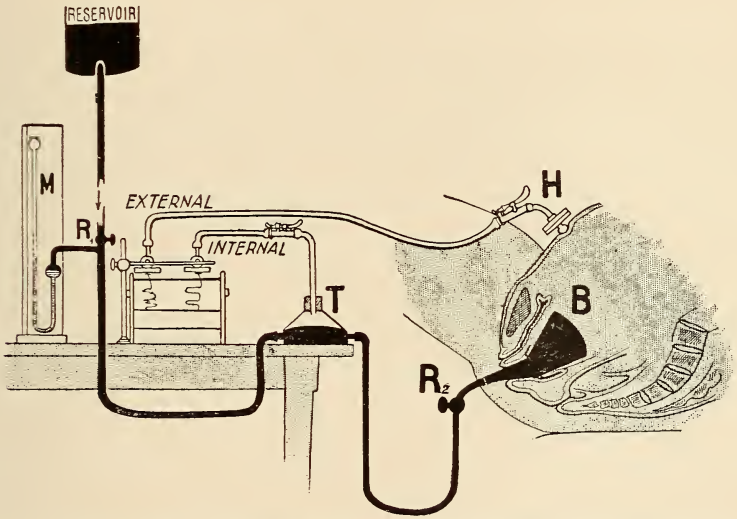


Fig. 107.—Combined method, (internal and external). *M*, manometer; *R*, reservoir; *E*, external hysterography; *I*, internal hysterography; *T*, transmitter; *B*, de Ribes bag.

five and fifteen kilogrammes, and that in difficult cases it may reach twenty-five kilogrammes (Figs. 106 and 107).

Why Are the Contractions Accompanied by Pain?—What is the cause of the pain that is experienced during a uterine contraction? This has been the subject of much discussion.

The most severe pain is experienced at the moment of complete dilatation of the cervix, and again when the head is passing the orifice of the vulva. This is sufficiently explained by the abundant nervous supply of these parts.

The compression of the nerves of the uterine wall during the contractions is often invoked as another cause.

Compression of branches of the lumbar and sacral plexus that pass over the brim of the pelvis accounts for the painful cramps in the thighs that form an unpleasant feature of the second stage.

But without going into detail, one may say that the question is hardly worthy of extended answer. No one considers it necessary to explain why the passage of a gall-stone through the common duct causes severe pain. Still less need we wonder that the passage of a body so large and hard as the fetal head, through so relatively small a channel as the birth canal, is productive of much suffering.

Attitude of the Patient During the Contractions.—During the first stage the patient prefers to walk about, but during a pain she remains standing, with the body bent forward and the hands clenched or grasping some stationary object, only to resume her walk when the pain is over. There is no "bearing down" at this time nor should there be. The contractions are those of the uterine muscle and are altogether beyond the control of the will.

During the stage of expulsion there is a tendency for the patient to assume the kneeling or squatting position, or if in bed to flex the thighs upon the body, grasp the hands of the nurse and press her feet against some stationary object, thus aiding the process of expulsion by her own efforts.

Very timid or nervous women will sometimes refuse to do any of these things, and from fear of pain will resist all impulses and disregard all directions to "bear down." This may often be remedied by a little primary anæsthesia with ether.

Objective Signs of Uterine Contractions.—Strangely enough the beginning of a contraction may be recognized by the onlooker before it is felt by the patient. It is appreciable both to the eye and the hand of the practised observer. As the contraction begins, the uterus, owing to the increase in its anteroposterior diameter, and to the downward and forward pull of the round ligaments, seems to approach the abdominal surface, and its pear-shaped outline becomes plainly visible through the stretched and thinned abdominal wall. At the same time the hand placed lightly upon the surface distinctly feels the hardening of the uterus (Fig. 108).

All this, however, is true of the painless contractions of pregnancy, except that the uterus does not become as hard as it does in active labor. It does harden to some extent, however.

Owing to the thickening and hardening of the uterine wall during a contraction the fœtus cannot be outlined and external palpation gives no results. It can be practised with facility, however, during the intervals.

During a contraction the fetal heart beats more slowly, and at the height of a contraction it is heard with difficulty. With the subsidence of the contraction it resumes its normal rate.

Effect of the Contractions Upon the Patient.—The first pains are so slight that they cause little disturbance of any kind. As the hours pass, however, and they increase in force and frequency, the pathetic moment arrives when the patient begins to form some conception of the ordeal before her.

After a few hours the pains have reached such a degree of severity that

their effect upon the organism can be noted. During a contraction the pulse becomes more rapid, and the arterial tension is increased.

There is said to be a slight rise of temperature, but it is so slight as to be practically insignificant. There is, however, a slight progressive rise of temperature during labor, especially if labor is prolonged or difficult. Of this we shall have occasion to speak later, in considering the clinical phenomena of the puerperium. The increase in the arterial tension causes an increased secretion of urine, and the patient often perspires freely as the result of the effect upon the nervous system of pain and anxiety, to which is added, in the second stage, the factor of great muscular exertion. The abdominal pressure makes respiration somewhat slower

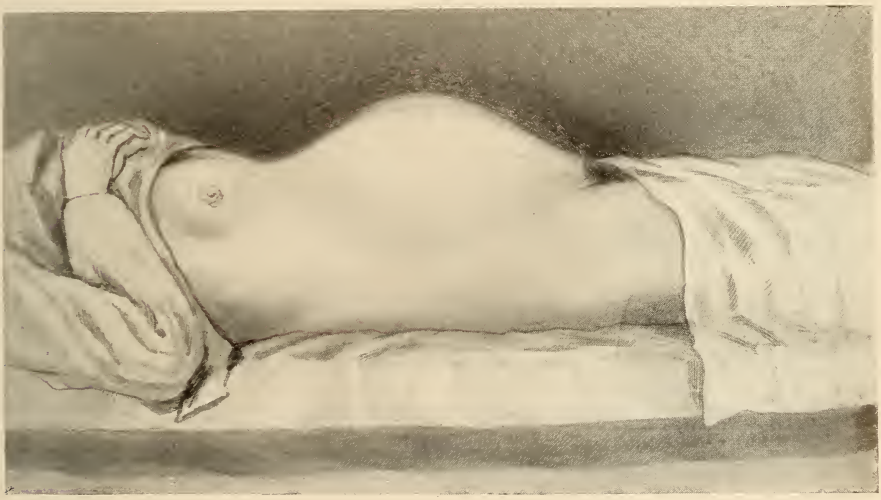


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FIG. 108.—Composite picture showing abdominal outline before and during a contraction. (After Williams.)

during a contraction, and as a consequence, somewhat more rapid during the intervals.

There is a marked leucocytosis during labor, which continues for several days. Its origin is uncertain but the importance of its recognition is obvious. For example, in cases of suspected infection it is plain that an increased leucocytosis does not have the same significance as at other times.

After the rupture of the membranes the patient is granted a brief respite from her sufferings. This lull is deceptive to the inexperienced. The amniotic fluid dribbles away but there is little or no pain. This rest is of short duration. Five minutes, perhaps. Nature is gathering her forces for the final effort. It is the beginning of the end; *Die Ruhe vor dem Sturme,* as Bumm eloquently phrases it. The pains recommence, but they

have assumed a different character. As already stated, they are less frequent and for a time at least less acute. But as the head approaches the floor of the pelvis the tremendous downward pressure alarms the patient who feels her powerlessness to resist it.

On the whole, however, these pains are better borne than those that have gone before. She feels conscious of some progress, feels that she can help herself. Moreover the cerebral congestion attendant upon the bearing down efforts induces a sort of physiological anæsthesia. During the final act of expulsion the pain again becomes insufferably acute, the patient perhaps crying out that she is being torn apart, but now a few drops of ether may well perform their merciful office and draw a curtain over this climax of suffering.

We have considered the mechanism of the expulsive stage in a previous chapter and there is little need of dwelling here on the clinical phenomena of this period.

As the head reaches the pelvic floor the straining efforts are redoubled and the facial congestion is more marked. Pressure upon the rectum causes the patient to think that she must go to stool, which, of course, cannot be allowed at this time. Fæces are often indeed usually squeezed from the rectum by the pressure of the head. This is a very significant and positive sign of approaching delivery.

The next thing noted upon inspection is a slight bulging of the skin surface of the perineum, followed by beginning separation of the labia. This separation becomes greater with successive pains and soon the occiput appears at the height of a pain only to recede as the pain subsides. But now a segment of increasing size appears with each pain.

Meanwhile the perineum becomes stretched and thinned over the advancing head until the distended vaginal orifice looks directly upward. The anus, too, is dilated and the rectal mucous membrane visible posteriorly. The occiput becomes fixed under the symphysis, and as extension occurs brow, nose, mouth and chin sweep successively over the perineum.

This description need not be prolonged. Those who have witnessed the process need no description and those who have not must witness it in order to appreciate it. Opportunities are frequent and there is no other way.

Atypical Labor.—Of course labor does not always proceed in the typical fashion outlined above. Variations from the usual order are common enough, and the observant practitioner will soon learn to recognize them. He should accustom himself early in his career to watch the progress of labor, and later when he has less time for such watching he will realize that the time was well spent.

In some cases the painless contractions of pregnancy gradually lose their innocent character and by degrees become quite painful, but the process is so slow that it is hard to tell when pregnancy stops and labor

begins. Again labor may make several false starts, as it were, before continuous labor is established. Now and then the pains are in pairs, first a slight one, then a severe one. In certain cases, fortunately rare, the onset of labor is sudden and its progress rapid and stormy from the start. Early in labor the pains become frequent and severe, occurring at intervals of three or four minutes during the entire first stage, the patient thus getting but little of the merciful relief usually afforded by nature. Far more commonly, however, the first stage is prolonged, the contractions while painful having but little effect in causing dilatation of the cervix. These cases are most apt to occur in women of the neurotic type, or there may be no apparent reason for the delay. Most common of all is simple delay in the second stage. The patient is either exhausted and cannot, or is frightened, and will not use her voluntary muscles. All these variations, if extreme, become pathological and will be dealt with when we come to the pathology of labor.

Some labors are almost painless. Now and then in multiparæ the water breaks while the patient is sleeping, and labor is completed with one or two pains. But these cases are not common. No race or class seems to be immune to the sufferings of labor, which are apparently the penalty of belonging to the human race. The comparatively larger size of the head in man undoubtedly affords the chief explanation. Those who hold the evolutionary hypothesis believe that the gradual assumption of the erect position involved certain pelvic modifications that have added to the difficulty. However this may be, the facts remain.

It is commonly supposed that working women, and strong and vigorous representatives of the wealthier classes, have easy labors. If any such rule exists it is certainly subject to many modifications. Weak, delicate, and anæmic women often have easy labors, while athletes are proverbially difficult cases.

Not infrequently one hears those of little knowledge and ready assumption assert that women of primitive races, *e.g.,* Indian women, have easy labors and rapid recoveries, the conclusion, expressed or implied, being that normal labor needs little supervision. These statements are not justified by the facts. I have been assured by physicians of experience, postgraduate students at the New York Polyclinic, that death in labor is not infrequent among Indian women, and that bad after results, *e.g.,* uterine prolapse, are common.

I do not recall seeing the statement in print, but it is my experience, that, other things being equal, tall and slender women have easy labors, and that labor is more difficult in stout women. But of course such rules are subject to many exceptions. In a multipara with capacious vagina and vulva, a few pains often suffice to end the second stage, even when the first has been long and tedious.

CHAPTER VIII

THE MANAGEMENT OF LABOR

General Considerations

Labor, it is true, is a natural process, and the ideal case, under ideal circumstances, would need no medical treatment at all. This, however, is a theoretical proposition. Such conditions do not obtain in practice. There is no case in which intelligent medical care cannot do something to alleviate suffering, to forestall complications, to maintain asepsis, to prevent laceration, or to conserve the life of the fœtus.

But it should be remembered that medical supervision does not always mean interference with the processes of nature. The physician should endeavor to draw a sharp line between normal and abnormal cases. In the latter, prompt and intelligent interference may be imperatively demanded; in the former, his attitude should be one of prophylaxis and watchful attention.

But if one is to recognize abnormal labor, he must first know thoroughly the phenomena of normal labor. This may mean hard work, loss of sleep, and absence from other and better paying work; but he who is not willing to pay this price should adopt a calling less arduous than that of the obstetrician. Now and then one meets a student who is not satisfied with anything less than a Cæsarean section, but who does not know how to locate the fetal heart or the fetal head. Again, one sees an article by some justly celebrated surgeon or gynæcologist describing an abdominal or vaginal Cæsarean section, and reading between the lines, discovers that the operator might have accomplished the same or a more favorable result by less radical measures, had he had a good obstetrical training.

The physician who interferes least with nature's processes in normal labor is the best physician, but this attitude of expectancy assumes that he is prepared to anticipate, and competent to recognize, any departure from the normal, and that he is sufficiently intelligent to recognize that nature's efforts are not always sufficient, but must sometimes be supplemented by the resources of art.

Preparation

So far as the physician is concerned, the most important part of the preparation has been made in the antepartum examination already described. If that examination has shown that the position, presentation, and pelvic measurements are normal and that no complications are present, and if a thoroughly good nurse is in attendance, he feels that the interests of his patient have not been neglected. He should instruct the nurse to notify him at once when labor begins, unless it begins in the middle of the

night or in the early hours of the morning. In such cases a good nurse may often save the physician a few hours of sleep without in any way endangering the patient. If, however, the physician has not seen the patient before, or if there is any suspicion of abnormality, he should, of course, respond at once.

The Physician's Outfit.—Elaborate and costly outfits are recommended

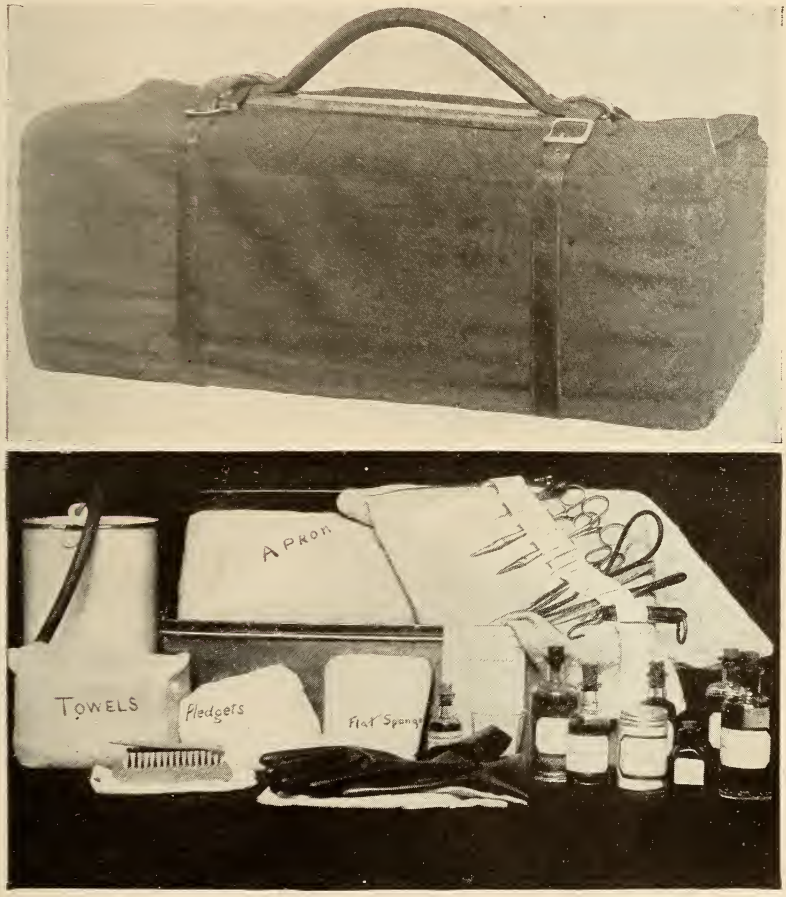

FIG. 109.—Delivery bag with physician's outfit. (Bellevue Hospital School for Midwives, New York City.)

in various quarters, each writer seeming to strive to outdo the others in complexity and impracticability. The result has been that most practitioners pay no attention whatever to text-book directions, each one devising some plan for himself. I will mention here only those things which experience has taught me are absolutely necessary, leaving it to the individual practitioner to modify or add to the list as experience may dictate.

First of all, since they are needed in every case, are materials for disinfection, including green soap, tincture of iodine, bichloride tablets or lysol. Personally, I long ago discarded bichloride tablets for reasons which will presently be explained. To the above should be added a sterilized nail cutter and cleaner, sterilized nail brushes, and, above all, sterilized rubber gloves. A sterile gown should always be at hand. In its absence, or in emergencies, a substitute may be improvised.

Drugs should include ether (never to be forgotten), chloroform, some preparation of ergot which can be used hypodermatically, and with this, of course, a hypodermic syringe *which has recently been tested.* Ampoules of pituitrin are a desirable addition to the outfit, as are also the various hypodermic tablets for emergency use, not forgetting morphine, sometimes very useful in delayed labor and in cases of hemorrhage or shock. A small quantity of silver nitrate solution (one per cent.) should always be at hand as a prophylactic against gonorrhœal ophthalmia, and its omission is to be regarded as a serious error. A solution of chloral hydrate (gr. xv to the drachm) is a great boon in cases of delayed and painful labor, especially in neurotic subjects. Tablets for making salt solution are useful in emergencies.

Instruments and Appliances.—The forceps, of course, should not be omitted. He who would be completely equipped, should have two pairs,—a Tarnier instrument for the difficult cases, and one of lighter construction and more moderate pelvic curve for the easier cases (see page 578). A tenaculum forceps or, better, two should always be at hand. Such a forceps is indispensable in hemorrhage from the cervix and very useful in perineorrhaphy. A tongue forceps and a laryngeal tube for use in asphyxia neonatorum, scissors for cutting the cord and for other purposes, needles, some large and strong with the curve of a silver dollar, for making the circuit of deep tears, others light and of smaller curve for fine or superficial suturing, and a good needle-holder must not be omitted. The physician should carry suture material in abundance; silkworm gut for ordinary tears, and catgut for buried sutures, necessary in tears of the third degree. A long dressing forceps, a thumb forceps, and a few artery-clamps should be added. A long soft rubber catheter is an absolute necessity.

Recalling the ever-present possibility of hemorrhage, it is never wise to be without a fountain syringe, though this should usually be provided by the patient. An intra-uterine douche-tube of glass should be a part of every outfit, since a hot douche may be necessary. *Material for packing the uterus should never be left at home.* This should be in the form of a few sterile gauze bandages four inches in width. A leg-holder of the kind elsewhere illustrated is simple, cheap, and very useful. Under no circumstances should the physician leave his stethoscope at home, especially if he is unaccustomed to listening to the fetal heart with his naked ear.

Kelly's pad and similar devices are cumbrous, difficult to disinfect, and

quite unnecessary. I have found them a positive nuisance in obstetric operations. The pad is sure to become displaced during forceps operations or version. A more useful appliance may be improvised from a piece of white oilcloth or even from newspapers, and covered with a sterile sheet.

Trays and pans for sterilizing instruments and appliances occupy a great deal of room and are usually too small. Indeed a tray that will contain water enough to cover the Tarnier forceps will fill a large bag. Something must be supplied or improvised, however. A wash boiler makes an excellent substitute. A fish kettle with rack such as can be found in any hardware store is very convenient. It should be at least sixteen inches in length. A "nest" of smaller trays for solutions, sponges, small instruments, etc., is very useful.

A few aseptic dressings, cotton, gauze, and the like, for emergency cases are indispensable; sterile tape, narrow and strong, for tying the cord should not be forgotten. This latter is usually not at hand when wanted.

Laparotomies are best performed in hospitals when this is practicable, but he who does much obstetric work should have a laparotomy outfit accessible for emergencies and consultations.

Nowadays it is not often found necessary to use the destructive instruments, but they should be at hand for emergencies, *e.g.,* perforation of the after-coming head. The instruments ordinarily needed are the perforator of Blot or Simpson, and the cranioclast of Braun.

While it is not necessary to carry all the things sometimes recommended, those which are really essential should never be left at home. This is especially true of country practice, in which the physician must often be far from home and from other physicians. How unfortunate, how tragic indeed, to be unable to empty a distended bladder, or to be confronted with a case of postpartum hemorrhage, and to have no appliances for giving a hot douche or for packing the uterus!

Finally, the physician should provide himself with a bag large enough easily to contain what is necessary. The bags carried by many men are not more than half large enough.

Preparations at the Home of the Patient.—In obstetrics it is the unexpected that happens, and one should strive always to be ready for emergencies. So far as the patient is concerned, however, it is best to do this quietly and not in such a way as to excite undue apprehension on her part.

There is a tendency nowadays to overdo this matter of preparation. Nothing is more foolish than to surround a young woman awaiting her first confinement, with watchful nurses, and to convert her bedroom into a combined pharmacy, sterilizing plant, and instrument cabinet. All this pedantic and unnecessary parade leads her to believe that some formidable operation is in contemplation, or that the whole matter is much more serious than is usually the case. At all events, it is well calculated to fill her mind with morbid reflections.

The room should be the largest, sunniest, cleanest, and best-ventilated in the house, although in midsummer it may be wise to select a room with northern exposure. One or two chairs and a table for drugs, instruments, etc., will be needed; otherwise, the less furniture the better. Carpets, rugs, and unnecessary draperies should be removed, not because they are a direct source of infection, but because the room and everything in it, including hands, trays, and instruments, can be kept cleaner in an atmosphere free from dust.

What should the nurse be instructed to have at hand? First of all, materials for disinfection and the preservation of asepsis. These should include lysol, alcohol, an abundant supply of sterilized gauze, sterilized absorbent cotton, and sterile towels. Sterile tape for tying the cord should be in readiness, and it is well to have on hand eight ounces of a saturated solution of boracic acid to be used for the child's eyes and for the nipples, since it takes some time to prepare this solution. A fountain syringe, clean and new, should always be at hand, or, still better, a douche can of white enamel with rubber tubing. Most of the so-called "confinement outfits" now sold are too expensive for the majority of patients, and contain many things that are quite unnecessary, or that can be improvised without trouble by any intelligent nurse.

The Bed.—This should not be too low and should be accessible from both sides. It should be covered with a firm mattress. Feather beds and similar contrivances are an abomination. An ironing board or still better a table cover under the mattress, prevents the patient from sinking down into a hole in the middle of the bed, a great inconvenience in domestic practice. The arrangement of sheets and draw sheets is usually best left to the nurse, but there is one thing which should always be provided and is usually lacking, namely, a piece of rubber sheeting large enough not only to cover the whole bed but to hang well below the edge of the mattress on both sides. White oil cloth makes a cheap and convenient substitute. Newspapers beneath a clean sheet make a very useful protection in an emergency. Even in the household of the well-to-do the piece of rubber sheeting provided for the protection of the mattress is almost invariably too small and the result is disaster.

Preparation of the Patient Herself.—During the last week or two of pregnancy care should be taken to secure a daily movement of the bowels by diet and the occasional use, if necessary, of a mild laxative like cascara or the citrate of magnesia. Castor oil, of course, should not be given unless it is desired to induce labor. In that case it should be the first step. Sexual intercourse should be prohibited. Not only is it an unnatural and repulsive practice at this time, but it may be the means of infection or of hemorrhage. I have known it to cause fatal bleeding in placenta prævia, and Williams reports a case in which it was the cause of a severe infection.

A daily bath with frequent washing of the vulva and adjacent parts with soap and water is to be advised. The pubic hair may be cut close with

scissors, but shaving the parts in normal labor is quite unnecessary. Indeed by scraping away the epithelium and making many small cuts and abrasions it is more likely to produce than to prevent infection. This, of course, does not apply to cases in which an immediate incision is to be made as in pubiotomy. Douches are quite unnecessary and more likely to do harm than good.

Preparations at the Beginning of Labor.—As soon as the pains have become well established the patient should receive an enema of a pint of soapsuds with a teaspoonful of turpentine. This often materially aids the progress of labor and contributes to cleanliness in the second stage. She should then receive a complete sponge bath of soap and water while standing in the tub. It is not wise for her to sit down at this time since the bath water may and often does enter the vagina, especially in multiparæ. After the bath the patient is attired in a clean night dress, with clean stockings and slippers, the vulva is covered by a pad of sterilized gauze, and she is allowed the freedom of her room.

So much for preparation. Let us now take up the management of actual labor; perhaps the most important task that falls to the lot of the physician.

In a general way the duties of the attendant in a case apparently normal may be summarized as follows:

1. To prevent infection.
2. To attend to the general hygiene of labor, which includes attention to the bladder and bowels, to diet, stimulation, medication, moral encouragement and similar matters.
3. To keep himself informed as to the condition of the fœtus.
4. To prevent perineal laceration.
5. To supervise the third stage with special reference to the prevention of hemorrhage, and the complete expulsion of the placenta and membrane.

The Prevention of Infection.—The general subject of the prophylaxis of infection is considered in the section on puerperal infection. We will consider here the specific measures to be adopted in normal labor. This is best done under two heads.

1. The disinfection of the physician, patient, and accessories (instruments, dressings, etc.).
2. The limitation of internal examinations and manipulations.

Disregarding the remote possibility of auto-infection it is evident that puerperal infection is introduced from without. There is one instrument that must be frequently used and that cannot be perfectly disinfected —the hand of the physician. It is evident that the question of hand disinfection is of prime importance. There has been much discussion as to what is the best method. Perhaps there is no best method. Reports of good results by different methods seem to indicate that success is due not so much to the particular chemicals that are employed as to the thoroughness with which the method, whatever it may be, is carried out. The

method which I personally prefer is a modification of that of Fürbinger, and is as follows:

The nails are first carefully cleansed of all visible dirt, should such unhappily be present, and the hands and forearms are then thoroughly scrubbed with hot water and sterile brush for five minutes by the clock, special attention being given to the nails, and to the sides of the fingers, so often neglected. Running water is always preferable. If this is not available the water should be frequently changed. The hands are then thoroughly dried with a sterile towel, and washed for five minutes in 80 per cent. alcohol, and later for five minutes more in a 1–1000 bichloride or a one per cent. lysol solution. The bichloride solution often causes an eczematous condition of the hands which makes them more difficult of disinfection, and for many years I have been in the habit of substituting for it a one per cent. solution of lysol with excellent results. This has the advantage of being lubricant and thus making examination easier for the patient and less likely to produce abrasions of the mucous membrane which themselves predispose to infection. Vaseline and similar unguents should not be used. It is so difficult to render them sterile and almost impossible to keep them so. Painting the roots and margins of the nails with tincture of iodine, as shown in Fig. 110, is an additional precaution. Various writers have secured good results with other methods which it is not necessary to describe here. One thing should be carefully noted, however, that all good methods have one feature in common, *viz.,* prolonged and thorough scrubbing of the hands with soap and water. This I believe to be the most important part of the whole process. *Macroscopical or gross cleanliness is the essential feature of hand disinfection.* Alcohol probably contributes to this end. Chemical disinfection is an additional safeguard never to be forgotten, it is true, but on the whole less important.

FIG. 110.—A drop of tincture of iodine applied to the subungual region extends readily to the parts so difficult to disinfect.

Let no one imagine then that should he, in some emergency, happen to be without chemical disinfectants he need necessarily despair. Wherever soap and water are to be had in abundance a large measure of success is obtainable.

Conversely there is little or no benefit to be derived from the immersion

in antiseptic solutions of hands that are not macroscopically clean. Chemical disinfection is not to be regarded as a fetich. A man who imagines that, by dipping a pair of not over clean hands in bichloride solution, he confers upon his patient immunity from the risks of internal examination is a dangerous man.

The best method of all, however, for avoiding contact infection is the wearing of rubber gloves (Fig. 111). With these we reach the acme of safety. Every accoucheur should have one or two pairs in his bag sterilized and ready for use. In general practice, where facilities for steam sterilization are lacking, they can always be sterilized by boiling and drawn on with the aid of lysol solution. In emergencies, *e.g.*, hemorrhage, they

FIG. 111.—*Top*, hand with usual variety of glove; *bottom*, long glove (gauntlet variety).

are absolutely invaluable. The gauntlet variety affords the greatest security. Whenever there is time, however, the hands should be thoroughly disinfected before putting on the gloves since the latter may tear or may be soiled in being put on. For obstetrical use it is not necessary that they be of the paper-thin variety. They may with advantage be somewhat thicker, in which case they are less likely to tear and need not be so often renewed.

Dipping the gloved finger or hand in lysol facilitates its introduction enormously. In my experience there is but one condition in which the glove interferes with the operator's sensation of touch. One cannot always tell whether the membranes are ruptured. If there is a projecting pouch of membranes, as during a contraction, it is of course easy. When, however,

the membranes are closely applied to the child's head with no intervening fluid, as is sometimes the case, their recognition is difficult. This, however, is not usually a matter of great importance since one can wait for a contraction or provoke one by artificial means.

Disinfection of Instruments and Appliances.—Whatever instruments or appliances enter the genital canal should be sterilized by heat. This applies not only to steel instruments but to all others. Rubber catheters can be boiled, rubber bags will stand several boilings, and so will fountain syringes and rubber tubing. There is no place so poor that fire and water are not to be had, and an instrument boiled for twenty minutes over the kitchen stove is as sterile as though it had been through all the laboratories in Christendom. Receptacles employed for sterilizing should hold enough water to cover the instruments contained. The very common practice of boiling the blades of the forceps but not the handles is not to be commended.

Nor need we be without sterile dressings. Towels, napkins and sheets can also be boiled or if there is no time for this can be taken fresh from the laundry and wrung out of lysol or bichloride solution.

Experience has convinced me that with care good results can be obtained amid surroundings that seem most unfavorable.

Some men seem to think that unless the patient is in a good hospital or in a comfortable home under the care of a skilled nurse asepsis cannot be attained, and efforts in this direction are a waste of time. This is a foolish and disastrous mistake, and has doubtless cost the lives of many women. The two great essentials for aseptic management of a case are plenty of soap and water and a good fire for boiling. Fortunately these can be had anywhere. A bottle of lysol or a few tablets of bichloride, a pair of gloves, a little extra time and attention—what are these in comparison with the safety of the patient and the added satisfaction of a clear conscience? Not to speak of a lower object but one by no means to be despised, freedom from criticism.

Disinfection.—The finger of the accoucheur may be sterile or as nearly so as it is possible to make it, and it may be clothed in a rubber glove that is absolutely sterile, but it cannot be introduced into the vagina without contact with the external genitals. Here we have another source of infection. The external parts are not free from bacteria and these may be carried into the vagina by the examining finger. True the danger is not great. Virulent organisms are not usually present upon the genitalia of healthy women. If they were, infection would be much more common than it is. But even though the danger be slight, it exists, and no possible source of infection should be disregarded. The matter is too serious. How then are we to prevent the transmission of infection?

1. By disinfecting the vulva.
2. By limiting the area of contact.

The disinfection of the vulva is accomplished as follows: The patient

is placed in the dorsal position with the knees widely separated and the sterile napkin that was applied after her bath is removed, the attendant disinfects his hands, and the parts are thoroughly scrubbed and irrigated from above downward, with lysol or bichloride solution, by means of sponges of sterile absorbent cotton which have been soaking in the solution. Thus the fingers need not come into contact with the parts. If the hands have become contaminated they must now be redisinfected. The operator

FIG. 112.—Patient prepared for pelvic examination.

now dons a pair of sterile rubber gloves and proceeds with the examination (Fig. 112).

Contact with the external genitals is limited as much as possible by widely separating the labia during the introduction of the fingers and by keeping the latter exactly in the median line.

Limitation of Internal Examinations.—But there is something else to be remembered in the prophylaxis of infection. Infection comes from

without and although we can attain a high degree of safety by the measures already outlined this safety is not absolute. Labor is a process extending over hours, or perhaps days. It is too much to expect that sources of error or lapses in technic will never occur or that accidental contamination is always avoidable. It is perfectly plain, then, that we should avoid all internal examinations that are not absolutely necessary.

Unfortunately this fact is not generally appreciated. It is still the custom with many physicians to proceed at once with vaginal examination as the first step in every case of labor. This is a mistake. In the first stage of labor one can learn much more from external than from internal examination. I have never had any difficulty in convincing my students of this fact in one or two lessons. Internal examination may or may not be necessary to correct or supplement the result of the external. Very frequent internal examinations are never necessary.

The methods employed in the external examination of pregnancy have been considered in connection with the antepartum examination. Palpation, of course, is not feasible during contractions, and at the height of a contraction the fetal heart sounds may become inaudible. During the intervals, however, both auscultation and palpation are usually feasible. Some patients are sensitive and hard to control at this time and the physician cannot work with the same leisurely care and thoroughness as at the antepartum examination; but brief anæsthesia will remedy all this.

By external examination one can determine the position of the head, whether above or below the brim, at the inlet or at the fundus, can follow the descent and rotation of the shoulder, and can keep himself informed as to the location and character of the fetal heart sounds. A knowledge of all or any of these things may, in a critical case, be of priceless value.

A little practice will suffice to show that internal examinations can be much restricted and in some cases avoided altogether. If the physician will study the external diagnosis of pregnancy with the same care that he bestows upon the physical diagnosis of cardiac and pulmonary diseases he will soon become able to limit the number of internal examinations to a minimum, and in many cases to do away with them altogether. To speak personally, I have found that I can get much more information from the external examination than from the internal.

There is a large proportion of cases in which it is perfectly plain to any thinking man that vaginal examination is quite unnecessary. Every practitioner knows from experience that unless he responds promptly when called to attend a multipara he is likely to be too late and yet if he does arrive in time he usually makes one or more such examinations, if only as a matter of form, even though it is perfectly plain that the patient is far advanced in the second stage and will soon be delivered.

Let us take a typical case. The patient has had several children before and her labors have been easy. The membranes have ruptured and the pains are becoming expulsive in character.

Palpation shows that the head is in the pelvic cavity and that the shoulder is only an inch or two above the symphysis. The patient's general condition is good, the fetal heart sounds are strong and regular, the vaginal outlet is capacious. Such a case needs no vaginal examination and infection is almost impossible.

The great majority of cases seen by the general practitioner are cases of normal labor in multiparæ and would get along perfectly well without any active interference whatever. Many of them when first seen have passed the time for most complications, and it is certainly deplorable that such cases should become septic through unnecessary manipulations.

But all cases are not of this kind and we must admit in general practice that many patients require vaginal examination for one reason or another. Palpation is not available in very stout women. The physician's time is limited and he cannot watch his cases from beginning to end as can the resident staff of a maternity hospital. Moreover there is no doubt whatever that vaginal examination is far safer than it was before the introduction of rubber gloves.

Since, then, vaginal examination must be practised to some extent how should it be limited? The question is not a simple one, and the answer will vary with the skill acquired in external examination. If external examination has shown position and presentation to be normal, no pelvic contraction, and if in the case of a primipara the head is well down in the cavity of the pelvis, or if in the case of a multipara previous labors have been easy, vaginal examination is unnecessary or at least there is no occasion for haste.

Repeated examinations during the first stage are unnecessary, though they may be desirable in some cases as helping to determine the progress of labor and enabling the physician to estimate its probable duration and to tell whether or not it is necessary for him to remain with the patient. As a general rule it is neither necessary nor desirable that the physician should remain with his patient during the entire first stage. In the case of a multipara, however, it is not wise for him to be far away after the cervical canal has become effaced and the os dilated to the size of a half dollar. In a case like this the resistance of cervix, vagina, and perineum has been overcome in previous labors and rupture of the membranes may be followed by a second stage of short duration—sometimes only a few minutes. In a primipara, however, cervical dilatation is much slower, and hours may be required to overcome the resistance of the vagina and perineum. It is usually safe, if a good nurse is in attendance, for the physician to absent himself for some hours, leaving word with the nurse to call him if well marked second stage pains should develop.

The physician is often asked as to the probable duration of labor. His reply should be cautious and conditional if he would keep his reputation as a prophet.

But to return to the question of repeated examinations during the first

stage. It has been said, and I think with truth, that in the average case there are only two things that cannot be learned by external examination, *viz.*, the degree of cervical dilatation and prolapse of the cord; but if labor is apparently progressing normally and if external examination shows that the head is descending it is pretty safe to say that the cervix is dilating and it hardly seems necessary to demonstrate this by measures that are prejudicial to the welfare of the patient. Moreover, there is little or no danger to the child before rupture of the membranes, and we can assure ourselves of its safety by auscultating the fetal heart at intervals.

Naturally more solicitude is felt in the case of a primipara than in that of a woman who has already borne a child at term, provided the latter has no history of difficult labor. According to the statistics of Matthews Duncan the liability to complications diminishes progressively after a first labor, until the ninth.

As the head advances the difficulty of examination becomes less, but in normal cases it can hardly be said that the necessity of examination becomes greater. There is, of course, no doubt that the ability to recognize promptly a delayed first stage, and the cause of delay, is of the highest importance and in doubtful cases the accoucheur should not allow undue timidity to prevent him from clearing up all doubt by thorough and careful investigation, under ether if necessary. On the other hand, however, he should carefully avoid falling into habits of indolent routine, and should perfect himself in every extravaginal method of diagnosis which may save his patients from examinations and manipulations that are not only unnecessary but at times dangerous.

There is no doubt that certain unfavorable conditions, *e.g.*, face and brow presentations, prolapse of the cord or of an extremity, are favored by rapid escape of the amniotic fluid, and there is perhaps some reason for making a vaginal examination immediately after rupture of the membranes. This will also determine the fact of their premature rupture, an accident which makes careful subsequent observation of the case imperative.

The necessity for frequent examinations during the second stage is not apparent, especially if examination after rupture of the membranes shows no abnormality. The changes in the size and shape of the abdominal tumor tell that the head is low in the pelvis and the experienced observer learns much from the demeanor of the patient and the character of the pains.

It would be interesting to pursue this subject at length if space permitted. Suffice it here that a brief study of the chief objects to be attained by vaginal examination will show that its employment in normal labor is too common.

Two things are certain: 1. If the physician can remain with his patient, little or no examining is necessary in normal cases; and 2. The more the physician perfects himself in the external examination of pregnancy the less need will he have for internal examination.

There is an unfortunate disposition among students and practitioners to regard diagnosis by external examination as an impracticable refinement or at least as something to be reserved for obstetric specialists. This is a great mistake. It is just as easy and of far greater practical use than much of the physical diagnosis that is taught in the schools as part of the course in general medicine, and it is absolutely necessary to the intelligent practice of obstetrics.

Technic of Vaginal Examination During Labor.—If the head is in the cavity of the pelvis the simple introduction of one finger may suffice. If it is at or above the brim two fingers will be required. The labia being widely separated by the fingers of one hand two fingers of the other are carried into the vagina. If the introitus is small, their introduction is favored by gentle backward pressure against the perineum, but it is well to avoid contact with the anus by keeping it covered by a sterile towel. The introduction of the fingers should be very slow and gradual, and the hand should be gloved and well lubricated with lysol solution. Nothing else makes introduction so easy. These precautions are well worth remembering. Rough and hasty work here is not only indelicate and cruel, but it alarms the patient, destroys her confidence in the physician, and fails to secure results. Gloves should be worn for three reasons. They diminish the danger of infection, and when well lubricated with lysol greatly facilitate the easy and painless introduction of the fingers. Last but not to be forgotten they may save the attendant from criticism.

What is to be determined by this examination?

The character of the presentation, the relation of the presenting part to the pelvic brim, the capacity and distensibility of the vagina and its outlet, and the capacity of the pelvis, not forgetting the length and inclination of the symphysis and the character of the symphyseal angle.

Methods of pelvimetry are discussed in the section on pelvic contraction. As in the antepartum examination, however, it will not be necessary to compel every patient to submit to a careful internal pelvimetry. For example, in the case of a multipara with a history of easy labors, such a procedure would obviously be superfluous. In most primiparæ the head is well down in the pelvic cavity at the beginning of labor, and here, too, nothing is necessary except to measure the pelvic outlet. Further the practitioner who uses modern methods will, in the case of his own patients, have already made himself familiar with the pelvic dimensions.

If, however, the patient is a multipara with a history of difficult labor, or if in the case of a primipara, the head is above the brim and cannot be made to engage by external pressure, a careful estimate of the pelvic capacity must be made. If the patient be a primipara or if she be very sensitive a light anæsthesia will not only make the procedure painless but will facilitate the examination in a high degree.

One should never forget to measure or at least estimate the pelvic outlet, since this causes the patient no pain and is excellent practice for the

physician. Moreover, outlet contraction is often overlooked, the observer taking it for granted that all is well because he finds the head in the cavity of the pelvis.

(As a rule position and presentation can be determined more easily by external examination, if the practitioner "knows his obstetrics.") The rules for the diagnosis of the various malpositions and malpresentations are given elsewhere. The hard globular vertex can be mistaken for nothing else. In the centre one feels the sagittal suture running transversely or obliquely across the field. In the ordinary L. O. A. position it runs obliquely and the small fontanelle is found at its anterior extremity, *i.e.*, somewhat anteriorly and to the left. From this fontanelle run three

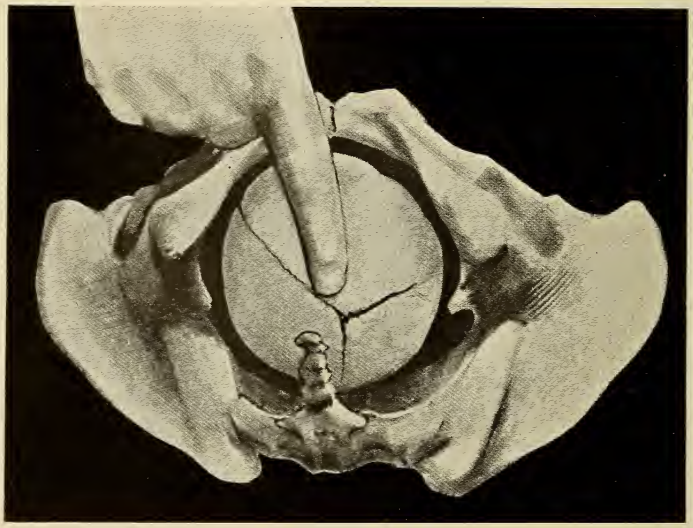

FIG. 113.—Digital examination in vertex presentation, L. O. P. Right hand follows sagittal suture and approaches the small fontanelle.

sutures, the sagittal and the two lambdoidal. During labor this so-called posterior fontanelle does not constitute an opening, a fact which often puzzles the beginner. The force of the uterine contractions causes the two parietal bones to override the occipital, and in the place of the fontanelle one feels the apex of an angle formed by the meeting of two ridges of bone which correspond to the two lambdoidal sutures. Backward and to the right is the large, anterior fontanelle, from which run four sutures; the frontal, the sagittal, and the two frontoparietal. This fontanelle is never closed, and gives the examining finger the impression that it is much softer and more depressible than the posterior. When the head lies transversely the sagittal suture will also be transverse and the fontanelles will be found, one at either side of the pelvis. When the occiput is posterior the position of the fontanelles is reversed, the small fontanelle being posterior, and the

large one anterior. Whatever the position of the head, if the small fontanelle is markedly lower than the large one the head must be well flexed, while if the two fontanelles are on the same level the head is moderately extended (Figs. 113, 114 and 115). It is usually easy to recognize the sutures and fontanelles in the second stage of labor, when the head is low in the pelvis, and the cervix fully dilated, and the beginner should lose no opportunity for this kind of practice.

As a rule it is not justifiable to invade the cervix simply to locate the sutures and fontanelles and thus verify the diagnosis of position, or for the sake of practice in diagnosis. This procedure, too common among students and hospital internes, not only causes considerable pain, but materially increases the risk of infection, and all this without yielding any corresponding benefit to the patient. It may not be out of place to recall here the well-known, but too often forgotten, fact that the danger of sepsis is distinctly increased when the finger is carried within the cervix or into the lower uterine segment, where the acid vaginal mucus no longer aids in inhibiting bacterial development. The man who finds it necessary frequently to resort to painful and dangerous methods of examination has not yet learned the principles that underlie management of normal labor.

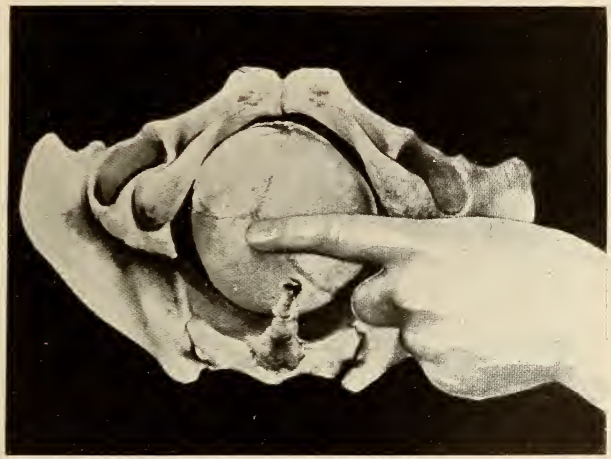

FIG. 114.—Vertex presentation, R. O. A. Left hand follows sagittal suture and reaches the small fontanelle.

If delayed labor with threatening symptoms makes an exact diagnosis necessary, and, owing to the height of the fetal head, the thickness of the abdominal wall, the absence of the fetal heart sounds, or a large caput succedaneum, the diagnosis of position by the usual methods difficult or impossible, it is better to give the patient a little ether and, if necessary, introduce the half hand. The patient is now relaxed and difficulties disappear. A most useful guide in these cases is the posterior ear. This,

of course, points in the same direction as does the occiput. But more of this when we come to the study of delayed labor and especially of posterior positions of the occiput.

Before making this final examination it is well to make every preparation for an eventual operation in order that, should the latter prove desirable or necessary, it may be performed at once and the patient saved the inconvenience and danger of added manipulation and repeated anæsthesia.

So much then for the prevention of infection, the most important part of the management of labor. But this is not all. There are certain general measures which experience has shown to be beneficial.

Conduct of the First Stage

The patient should not be put to bed during the first stage. As a gen-

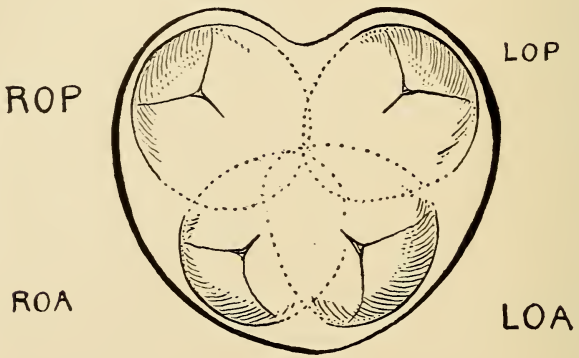

Fig. 115.—Diagram showing position of the small fontanelle in relation to the superior strait.

eral rule she prefers to be upon her feet and it is far better that she should be. The upright position favors engagement of the head and dilatation of the cervix. This fact has been amply demonstrated by experience. There are, however, certain exceptions to this rule, *e.g.*, in breech presentations and in contracted pelvis, premature rupture of the membranes is especially unfavorable, and at the same time especially likely to occur, and for these reasons it is wise to keep the patient quietly in bed. The same precaution is obviously necessary in placenta prævia and in prolapse of the cord. If labor begins at night and the patient shows a tendency to sleep between the pains she should, of course, be allowed to sleep, since a sleepless night is a very poor preparation for the ordeal that is to follow.

The patient *should not make any bearing down efforts during the first stage.* She is often advised by ignorant nurses or bystanders to bear down. Such advice is bad. The contractions of the first stage are contractions of the uterine muscle, involuntary muscle, be it remembered, and are

entirely independent of the will. Expulsive efforts can only result in needlessly tiring the patient and perhaps in causing premature rupture of the membranes.

Attention to the Rectum and Bladder.—A full bladder is a serious obstacle to the progress of labor since it prevents uterine contraction. The patient should empty the bladder every two or three hours, and the physician should satisfy himself by palpation that the bladder is empty. The statements of the patient or the nurse can never be depended upon in this respect. This is usually due to the fact that the parts are benumbed from pressure. Then, too, the escape of liquor amnii is often mistaken for the passage of urine. A full rectum tends to inhibit uterine contractions but not to the same extent as does a distended bladder. It is also a mechanical obstacle to delivery. The soapsuds and turpentine enema should be given if this has not already been done, using only a vessel that has recently been cleaned and scalded. After each emptying of the bladder or rectum the vulva should be carefully cleansed from before backward with lysol solution and a fresh dressing applied.

Psychical influences play an important part in the management of the first stage of labor, and in the process of cervical dilatation. During the second stage, and especially after the rupture of the membranes, the reflex influence to bear down is usually imperative and not to be resisted, but in the first stage much depends upon suggestion and mental influence. This soon becomes known to every observant physician. The quiet and orderly progress of the first stage of labor is favored by leaving the patient alone, *i.e.*, with only the attendance and companionship of a sensible and competent nurse. There are times when the absence even of the physician is of more service than his presence. Curious and officious people should be banished from the room or, better, from the house. Overexcited relatives usually do more harm than good.

In every long and painful first stage some effort should be made to alleviate the sufferings of the patient, and this should be regarded as an important part of the treatment. There is neither sense nor science in permitting the patient to suffer more than is necessary. Moreover, the agents that reduce pain also cause relaxation of the cervix and thus actually shorten the first stage of labor. Of these agents chloral has always been a favorite with me. Unlike the " twilight " treatment it has no tendency to prolong the second stage. Fifteen grains, well diluted, are given as soon as the pains become severe. This drug is sometimes irritating to the stomach and in this case may be given in double dose by the rectum. It does not abolish the pain but diminishes its severity, the patient often sleeping in the intervals. Morphine has a similar effect, but is more likely to narcotize the fœtus, a result which I have not observed with chloral. If one prefers the morphine-hyoscine combination, ⅙ gr. of morphine may be given with 1/150 gr. hyoscine, the latter but not the morphia being repeated in from one-half to three-quarters of an hour. I do not, as a

rule, advise the continuance of the morphine and hyoscine during the second stage, except under special and expert supervision. We will come to this subject again in connection with obstetric anæsthesia. I wish to emphasize here my utter rejection of the idea that pain is a necessary or, so to speak, a conservative force in labor. A woman may have contractions that are not efficient though very painful, and again she may have powerful and efficient contractions without excessive pain. The idea that pain is to be, as it were, encouraged, was born long ago of ignorance and fanaticism and dies hard, but it is perfectly plain that contraction, not pain, is the essential element in labor.

Anæsthesia.—We may assume, I think, that the patient under ordinary circumstances does not need and should not have anæsthesia during the first few hours of the first stage. Pain at this time is not unbearable. Many indeed there are who would decry the attempt to give the patient relief during any part of the first stage. This depends, I believe, upon the prevalent but erroneous idea that pain in labor increases progressively in severity from the beginning of the first to the end of the second stage. As I have tried to show, in connection with the clinical history of normal labor, the greatest suffering, with the exception perhaps of that which is experienced during the final act of expulsion, is experienced at and shortly before the period of full dilatation of the cervix. When we recall that this can be greatly mitigated by the administration of a few drops of ether with each pain, and this with little or no risk, humanity seems to demand that in aggravated cases we afford the patient this measure of relief. This method can be employed when the physician is not called until the patient is far advanced in the first stage. Fifteen or twenty minutes of intermittent administration is a great relief to the patient at this time and helps her to bear better the ordeal of the second stage.

When the physician sees his patient at an early stage of labor he may administer some analgesic by the mouth or rectum.

In the second stage, chloroform is still a favorite with many practitioners who hold that in competent hands it is a safe and convenient agent for primary anæsthesia during the pains and pushed to the surgical degree for a few moments only, during the last act of expulsion. There can be no doubt that women in labor enjoy a remarkable degree of immunity from the toxic effects of chloroform.

Despite its popularity and undoubted convenience, I have gradually become convinced of the superior safety of ether not only in obstetrical operating but also in the primary anæsthesia to which we so often resort for the alleviation of the "pains" of the latter part of the second stage in uncomplicated labor. For the latter purpose it is best given on an ordinary chloroform mask and in drop doses and when properly administered the physiological effect of the ether supplementing the cerebral congestion which attends the bearing down efforts is such that analgesia may be induced by the use of an incredibly small amount of the drug. My experi-

ence has taught me that chloroform, even in small doses, causes more or less uterine relaxation and postpartum oozing.

Nitrous Oxide-oxygen.—This gas, used by obstetricians some forty years ago, has recently come into favor again. In the hands of an expert anæsthetist it has proven harmless in the great majority of cases, and with apparatus recently perfected is well adapted to routine hospital practice. Its use is indicated, like that of ether, as an analgesic, when the first stage is far advanced, given only with the pains, and later for complete anæsthesia as required. Nitrous oxide-oxygen does not retard labor, but rather stimulates uterine contractions. The misuse of this gas has caused rapid asphyxiation of the fœtus. Oxygen must be liberally supplied, the relative quantities of the gases being varied according to the character of the pains. Instances in which this method is particularly applicable are noted elsewhere.

"Twilight Sleep."—There has been much heated discussion about the value and the dangers of twilight sleep. Undue conservatism has opposed it, as it always opposes everything that is new. Unhappily, something of the stupid and cruel superstition that suffering during labor is in itself beneficial still lingers in the minds of many.

On the other hand, an overzealous and often unintelligent advocacy of the method with an apparent determination to ignore its possible dangers and to resent legitimate and well-meant investigation and criticism has done much to keep it out of the hands of those best qualified to judge as to its real merits.

On one point all are agreed, *viz.*, that the twilight sleep as practised at Freiburg, and as advocated by its chief exponents elsewhere, is not adapted to general practice, at all events, not unless the attending physician can remain constantly with his patient or can command the services of a competent assistant during his absence. I strongly resent, however, the assumption that the average general practitioner is less qualified to manage these cases than the average general surgeon or gynæcologist. There are comparatively few of the latter who have the time or the inclination to devote long periods to the laborious and ill-paid work of pure obstetrics. The general practitioner is obliged to do this work whether he will or not, and his obstetric judgment, if I may use such a term, is usually far better.

The thing which strikes the observer most forcibly is that the dose has been materially reduced, especially the amount of opiate has been materially reduced. The use of a reliable preparation of scopolamine is insisted upon at Freiburg. There are two difficulties in its preparation. It is not easy to isolate and if the work is not properly done various impurities may be present. Then, too, solutions of the drug deteriorate easily. It is claimed at Freiburg that it will keep for years in a ten per cent. solution of mannite, the so-called scopolamine Haltbar. One often hears the question from those interested in twilight sleep, "What is scopolamine?"

It is nothing more nor less than hyoscine. The mannite solution keeps better. That is all.

Narcophin (morphine-narcotin-meconate) has been much employed at Freiburg and elsewhere and is still on trial. Its advocates claim that it is less toxic than morphine and equally efficacious. Apparently this has not as yet been proven.

As far as my experience goes I have not found that the treatment injures the mother. A certain small proportion seem to have an idiosyncrasy against the drug. They become excited and even maniacal and are difficult to restrain or control. In these cases it may be necessary to give up the treatment since an aseptic management of the case becomes impossible. The treatment certainly prolongs the second stage of labor and perhaps increases the number of low forceps operations, but this is counterbalanced by the fact that lacerations are rather less common. Contrary to my preconceived opinions and prejudices I am compelled to say that as far as my observations have gone uterine relaxation and hemorrhage are not more common than under other methods of treatment or when no analgesics or anæsthetics at all are used. As far as the toxic effects of the drugs are concerned I have seen no harm except perhaps in the case of the excitement mentioned above. There are certain factors which operate during labor as antidotes to the depressing effects of analgesics and anæsthetics. These factors operate in the case of scopolamine as well as in that of chloroform and ether. This is shown by the fact that in the one case, as in the other, a patient who has been more or less restless during labor falls into a profound sleep as soon as labor is over. On the whole I believe that the use of these drugs is less dangerous to the mother than is the reckless fashion in which I have often seen chloroform used.

The darker side of the picture appears when we come to consider the effect of the treatment upon the fœtus. In Gauss's series of 506 cases the fetal mortality was about two per cent., which, when we consider that they were all picked cases, *i.e.*, that cases in which there was any reason for apprehending danger to the fœtus were excluded from this list and that all the labors and deliveries were conducted by skilled obstetricians, seems rather high. We must not forget, too, the undoubted tendency of all observers, no matter how conscientious, unconsciously to interpret statistics as favorable to the cause which they represent. To take a single example, the contention that all danger to the child may be prevented by listening to the fetal heart is absurd. Men differ in their ability to hear the fetal heart and interpret what they hear. If we do not begin delivery until we are satisfied that the fœtus is actually in danger we may be too late. Moreover, there are cases in which for one reason or another the fetal heart sounds cannot be heard although the fœtus is alive and vigorous. Hasty delivery under these circumstances may do serious and unnecessary harm. Dr. A. J. Rongy, who has had a large experience with the "twilight sleep," stated recently that he now uses the method much less than formerly, having

become convinced that it is attended by a distinct risk to the child. Many other advocates of the method lay great stress upon the necessity of constant watchfulness with respect to the welfare of the fœtus.

The morphine-hyoscine combination was first used in obstetrics by Steinbuchel, though it had been in use in general surgery since its advocacy by Schneiderlein, in 1899. In 1902 Steinbuchel reported his results in thirty-one cases, and his example was followed by various observers both in America and Europe. Notable among these were Cremer, who, in his monograph, *Entbindung ohne Schmerzen,* and other articles, reported 134 cases, and Bertino, who reported 400 cases. Steinbuchel gave morphine gr. ⅙ and scopolamine gr. 1/200, repeating the dose in two hours and again, if necessary to produce the required degree of analgesia. In some cases he used as many as five injections. Even at this early date some of those who followed him seem to have discerned the fact that good results may be obtained with a much smaller dosage. Bertino reported a large number of asphyxiated children, though it must be admitted that the doses which he used were larger even than those of Steinbuchel.

The method, or something like it, was practised and the results reported by many observers in this country, a semi-proprietary preparation, the familiar H. M. C. (hyoscine, morphine and cactine) tablet, being used. The treatment, however, soon became unpopular, owing to the fact that "blue babies" and still births became alarmingly frequent. This fact I have abundant opportunity to confirm from the graduate students of the New York Polyclinic, who represent all sections of the country.

Of course this purely empirical and rather haphazard method produced results varying with the physician's experience and judgment. If he was wise enough to carefully restrict the size of the dose as well as the number of doses he secured a gratifying degree of analgesia without doing harm. But it was necessary to learn this by experience and it is to be feared that many a fetal life was snuffed out in the process. Neither in Europe nor America was any attention paid to the memory test nor were the dangers of overdosing generally recognized. " Twilight sleep," in the sense in which the term is now used, did not exist.

It was not until 1906 that Gauss published the results obtained by a new technic devised by himself and designed to produce a sort of semi-narcosis which he christened by the happy term *Dämmerschlaf.* Not satisfied with the diminution of suffering or even with prolonged periods of sleep he sought to abolish all memory of pain. This he succeeded in accomplishing in a large proportion of cases. Hellman has written a very clear and concise history of the subject. According to his own statistics a satisfactory amnesia was obtained in 76 per cent. of his cases and marked relief in 18.2 per cent. He gave larger quantities of the drug than are usually given nowadays, for example, in a case lasting over fifty-seven hours he gave 1/17 gr. scopolamine and ½ gr. morphine. As a rule,

however, he found that no great increase in dosage is necessary to produce amnesia, but that it is rather a matter of giving the doses at the right time and of the careful application of the memory test. He aimed to keep the patient in a condition in which, although she responds to direct questions and perhaps shows a reflex response to painful contractions, she has lost the power of remembering recent events. This is determined by calling her attention to recent events, for example, by showing her a watch which has been shown her an hour before. In the condition which Gauss aimed to bring about, and, in a large majority of cases, did bring about, the past and future are alike a blank. The patient lives in the present alone, and as the present fades into the past it disappears never to return, not even in memory. This, of course, is more than analgesia or the mere relief of pain. It is analgesia plus amnesia; the relief of pain plus the obliteration of all recollection of the parturient process. Sometimes this state is easily produced. I recall the case of a patient who received ⅙ gr. of morphia and 1/150 gr. of scopolamine early in the first stage and forty-five minutes later 1/200 gr. of scopolamine with the result that she slept quietly until long after labor was over and upon awakening had no recollection whatever of what had occurred. Unfortunately, however, such an ideal result cannot always be depended upon. There are many cases in which the desired amnesia can only be obtained by repeated doses of scopolamine and even by an additional dose of morphine. This, of course, requires careful, constant and expert supervision. Gauss and all subsequent workers in this have found that in order to succeed it is necessary to individualize the cases, watching each patient carefully and repeating the dose and varying the dose, or preferably its frequency, according to circumstances.

What are the effects of the treatment upon mother and child? Fifteen or twenty minutes after the first injection the patient usually becomes quiet and drowsy and after one or two subsequent injections the typical "twilight" condition is developed. The patient lies in a semi-stupor with flushed face and dilated pupils. She grimaces and moves about during a contraction. Here the suggestion of Hellman is very useful. If at the close of such a contraction the patient, in reply to questions, shows that she has no recollection of painful sensations, her degree of amnesia is regarded as satisfactory. It must be admitted that the appearance of the patient at this time is not such as to console her friends or to reassure the inexperienced attendant. In some cases her outcries and contortions are such as to convince anyone that she is really suffering acutely and yet after delivery she will declare that she remembers nothing at all of the affair. It will be impossible, however, to convince her immediate family of this if they are present during labor, and it is for this reason that Polak shrewdly advises that near relatives be excluded from the room. As the exclusive pains of the second stage become stronger the reflex response of the patient becomes greater and at the final moment of expulsion she may become

quite uncontrollable, strangely enough requiring perhaps a few drops of ether to complete annihilation of pain and blotting out of memory. Sometimes the patient awakes at this time and realizes for the moment what is going on and this so vividly that she remembers it afterward. This is an example of what are called in the picturesque terminology of Gauss, "Islands of memory." It is the aim of those who strictly follow the Freiburg technic to avoid these "Islands of memory" or at least to limit them as far as possible, since Gauss claims that if they occur too often the patient is able to reconstruct from them the entire history of labor.

What is the Freiburg technic as now practised? For the sake of fairness I condense the description from Hellman's monograph, quoting accurately but not verbatim. The first injection is given when the cervix has become dilated to the extent of two fingers and when, in the case of a primipara, the pains recur regularly every five or six minutes, in the case of a multipara, not less than every seven to eight minutes. It consists of morphine hydrochloride gr. ¼ and scopolamine hydrobromide gr. 1/150. No more morphine is given, the succeeding injections consisting entirely of scopolamine, the usual amount being gr. 1/150. Forty-five to sixty minutes after the first injection the succeeding one is given and subsequent injections are given at intervals of from thirty minutes to two hours, as determined by the memory test, which is applied every ten or fifteen minutes, and by the condition of mother and child. The number of doses administered is said to be of less importance than their effect, Hellman finding that from three to seven are usually sufficient. The patient is kept in a darkened room. Dark glasses or a cloth over the eyes, and plugging the ears with cotton are helpful. The bladder must be carefully watched since the patient in her condition of semi-stupor may not recognize or respond to the ordinary stimulus of distention. Personally, I am of the opinion that the prolongation of the second stage so often observed is due in part to the neglect of this precaution. Moreover, as we have observed elsewhere, the use of the catheter is far more likely to produce infection after delivery than before.

The practical question for us to consider here is, What have we learned from the Freiburg school? How far can this new knowledge be safely applied in general practice?

May I venture to summarize my opinions as follows:

A very considerable degree of first stage analgesia may be realized through the employment of a very small quantity of morphine and hyoscine, a quantity so small as to be without danger to mother or child.

Two doses are preferable to one since it has been clearly shown that the cumulative effect of a second very small dose of hyoscine produces better results than the administration of the entire quantity at one dose.

Analgesia during the second stage is best produced by the administration of ether by the drop method and only at the height of a pain. The

attendant should be content with partial anæsthesia at the height of pains except perhaps when the head is passing over the perineum.

No attention is paid to the memory test, as no effort is made to secure amnesia. If no relief is afforded by the two injections, which is not often the case, no third injection is given.

Of course, this is not twilight sleep. It is only a partial substitute, but it has the advantage of being safe and applicable to general practice and it certainly very materially diminishes the suffering incident to labor. In some of our cases at the New York City Hospital nothing more than the first two injections was necessary to produce analgesia so complete that no ether was required during the second stage, the patient awaking a few hours after delivery with no recollection of what had happened.

The artificial rupture of the membranes as soon as the cervix is completely dilated is advised by many writers. This is a grave mistake and one for which the inexperienced accoucheur has often had occasion to regret his teaching. There are certainly frequent occasions, especially in multiparæ, in which labor may be promptly terminated by artificial rupture and the patient thereby relieved of much unnecessary suffering, but for the decision experience and good judgment are required. The young and inexperienced physician will do well to be cautious in this respect.

Nature's method of overcoming resistance to the progress of labor is by hydrostatic dilatation, and this is not finished with expansion of the cervix. The upper part of the vagina as well must be dilated and the head must be well down before the vaginal muscular coat can aid in expulsion. When the perfect physiological dilator is lacking lacerations are more frequent and sepsis more common, and how often, under anæsthesia, it is found that there is more of the cervix left than was supposed.

Not only do the unruptured membranes help to dilate the upper vaginal segment, particularly in primiparæ, and to prevent precipitate labor in multiparæ—they are a safeguard against infection, both by lessening the number of lacerations and by flushing the vagina when labor is nearly complete.

The loss of the amniotic fluid is followed by uterine retraction, subjecting the fœtus to direct pressure and lessening its oxygen supply by diminishing the calibre of the placental vessels. This may render necessary an otherwise avoidable forceps operation to save an asphyxiated child.

Conduct of the Second Stage

As the second stage approaches it is better for the patient to lie down, thus reducing the danger of prolapse of the cord or of small parts which sometimes occurs when the membranes rupture. It is not necessary, however, for her to occupy the dorsal position constantly, as is so often urged. This is a pernicious practice and is often responsible for delay in the second stage. It is much better for the patient to lie upon her side, part of the time, and to change her position at will. If progress is slow it may be materially aided by having the patient lie upon the side opposite to

that toward which the fundus is directed. Since the uterus usually occupies a position of right obliquity this will usually be the left side. The fundus then sinks toward the median line, the long axis of the uterus becomes parallel with the long axis of the body, and the head is pressed directly downward in the axis of the birth canal, or rather of whatever part of the canal it may occupy. I have many times had occasion to verify the efficacy of this simple manœuvre. In the rare cases of left

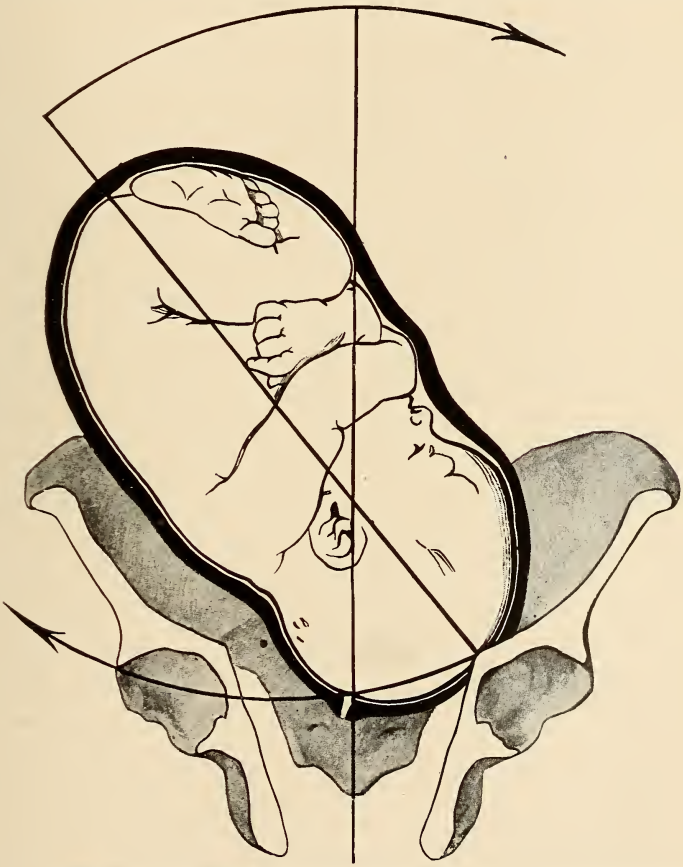

Fig. 116.—Head resting on left ilium. Entrance favored by patient lying on her left side.

uterine obliquity the patient would, of course, lie upon her right side (Fig. 116).

If progress is slow the patient should be encouraged to brace her feet against some fixed object, at the same time pulling upon the hands of a bystander, a twisted sheet, or some one of the special devices employed for the purpose, meanwhile holding her breath and "bearing down." During the intervals she should remain perfectly quiet, thus conserving her strength for the next pain.

If labor is progressing rapidly it is better for her to remain in the dorsal position and to avoid bearing down efforts, thus minimizing the dangers of precipitate labor.

During the latter part of the second stage the pressure of the descending head causes fæces to be expressed from the rectum. These should be carefully wiped away *in a backward direction* with sterilized absorbent cotton and the parts irrigated with lysol solution.

The squatting position as practised among primitive peoples is often

FIG. 117.—Preserving the perineum.

efficient in the second stage. It is the position naturally assumed when expulsive efforts are made with the abdominal muscles, and the pressure of the thighs against the abdomen tends to lift upward a pendulous uterus and bring its axis into coincidence with that of the remainder of the birth canal. Its disadvantages are the danger of precipitate expulsion and of perineal laceration.

Better, perhaps, is the exaggerated lithotomy position, popularized by DeLee. This retains the advantages of the squatting position without its disadvantages.

Care of the Perineum.—From a study of the causes of perineal laceration it is easy to deduce the following principles of management:

1. Descent and flexion of the fetal head should be complete before expulsion is permitted to occur. Thus only can the smallest diameter be made to present at the outlet.

FIG. 118.—Another case. Preserving the perineum.

2. The movements of extension, by which the final passage of the head is brought about, should be slow, gradual, and intermittent.

3. The head should be delivered in the absence of a pain.

4. Support of the perineum is not indicated. It is the head, not the

perineum, that needs support and to which restraining pressure should be applied.

5. The posterior shoulder should not be allowed to plough through the perineum (Figs. 117, 118, 119 and 120).

TECHNIC.—As soon as the head becomes visible during a pain, the attendant should be on his guard and ready to restrain its further advance if necessary. No active interference is indicated at this time, however.

FIG. 119.—The same case. Farther advanced. It is becoming necessary to use the full hand in retarding the progress of the head.

It is a mistake to begin treatment too early. He should be content to watch the gradual advance and recession of the head. Nature can do this part of the work better than art. When the head remains visible between the pains, constant vigilance is required, and as a larger and larger segment of the occiput appears, the physician should restrain and control its advance

by pressure applied to the head itself. Kneading and stretching the perineum, and passing the fingers between the occiput and the symphysis in search of imaginary obstacles, do no good, but only serve to increase the risk of infection. As the occiput is about to merge, it is grasped in the full hand and its too rapid delivery prevented. In easy cases it is sufficient to advise the patient to breathe with her mouth open and not to "bear

FIG. 120.—The same case again. Emergence of the forehead and face. No perineal tear visible as yet.

down" during the final act of expulsion. If the patient is a primipara or if the suffering is severe, relaxation may be promoted, "bearing down" efforts prevented, and pain abolished by the administration of an anæsthetic.

Delivery of the Shoulders.—After the birth of the head there is usually a pause of variable duration before the shoulders are born. This gives the mother a short interval of rest, allows time for uterine retraction, and apparently does no harm to the child, whose face, however, becomes much congested. Few men know just how long this period would last, since few have the repose to wait long enough to see, and there would probably be no special advantage in doing so. If the cord is wound around the neck of the fœtus it should be disengaged and drawn over the fetal head (Fig. 121), since the condition involves some danger of fetal asphyxiation. Most writers advise, if the cord cannot be drawn over the head, it be cut between two clamps, and the child immediately extracted. This I have never found it necessary to do. In case of delay in the extraction of the shoulders, one would be in an awkward position. I must admit having torn the cord in a few instances, but without harm to the child.

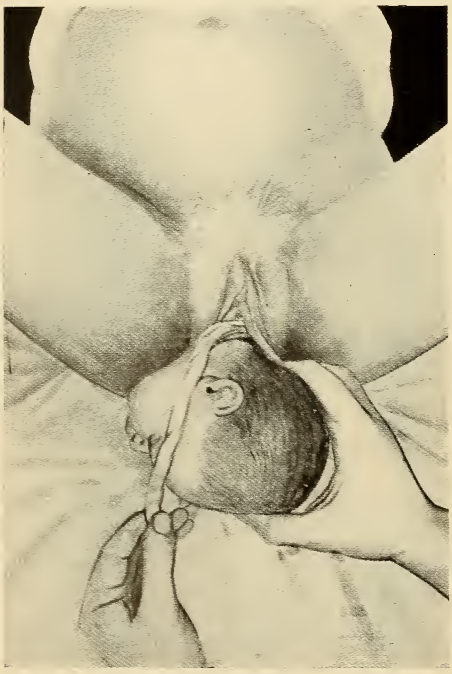

Fig. 121.—Passing a loop of the cord over the fetal head.

We now come to an important matter,—the delivery of the shoulders. It is my experience that most men have not mastered the technic of shoulder delivery. Clumsy work here may result in considerable delay, and it vastly increases the danger of perineal laceration, often transforming a very slight tear into one of the second or even third degree, and occasionally results in brachial paralysis. If the shoulders do not follow the head after a reasonable interval, patient should be quickly placed in the cross-bed position with her hips well over the edge of the bed, and, with the two full hands placed on either side of the head and face, as shown in the accompanying illustration, traction made directly downward, *i.e.*, toward the floor (Fig. 122). This downward traction cannot well be made with the patient lengthwise in bed. As soon as the anterior shoulder appears at the subpubic arch, the head is carried directly upward, *i.e.*, toward the ceiling, and thus the posterior shoulder is lifted over the perineum, not allowed to plow through it.

Physical and Moral Support.—When an athlete is about to undergo some test of courage, strength, or endurance, or when a soldier is about to

undertake a long march, he is carefully trained. He is prepared for the ordeal by good food and plenty of sleep, and, while undergoing it, he is sustained, if necessary, by stimulants and oxygen, as well as by the support

FIG. 122.—The same case as in Fig. 119, continued. Delivery of the anterior shoulder. Note the congestion of the child's face.

and attentions of attendants and trainers. Napoleon it was who said, "An army marches upon its stomach."

A woman who has before her a tedious or difficult labor needs the courage and endurance of soldier and athlete combined. And yet, how often

do we find a patient about to begin the second stage of labor who has had neither sleep nor food for twenty-four hours! This strange anomaly is not the result of lack of sympathy or solicitude on the part of those about her. It is due to the fact that people lose their heads at such a time. The patient herself naturally thinks little of food or sleep, her immediate relatives, more anxious than she, forget all about it, and the doctor, neglecting, perhaps, to mix common sense with his science, regards the problem as a purely surgical one.

I have said above that a patient should be on her feet during the first stage. If, however, the first stage begins at night, or after a sleepless night, she should be encouraged to sleep between the pains, and, if the latter are unusually severe and the patient highly nervous and apprehensive, it is well to secure sleep by the administration of chloral, gr. xv, or a full dose of morphine hypodermically.

The patient should receive a sufficient quantity of nourishing food early in labor, as it may be difficult to induce her to take it later. Milk and solid food in large quantities are perhaps not advisable, as anæsthesia may become necessary later. Soups, broths, weak tea, coffe, or wine if the patient is accustomed to its use, with a few crackers, are sufficient, and help to revive the patient's strength and improve her morale.

If the patient's strength and courage begin to fail during the second stage, strong black coffee will often be found very helpful. If she prefers, a little wine or brandy may serve a similar purpose.

Skilled nurses and sympathetic attendants can do many little things that are grateful to the patient. Pressure over the sacrum during the first stage usually gives some relief, and as the pains become more severe the patient finds the presence and the physical support of some friend or nurse a great help. Oversolicitous relatives, however, usually do more harm than good. Moistening the mouth and lips, which often become dry during the expulsive efforts of the second stage, rubbing the legs for the painful cramps that so often occur at this time, are examples of little things that in the aggregate mean a great deal. And to physical aids should be added sympathy and encouragement and kindly direction.

Starvation, loss of sleep, and mental depression, constitute a poor preparation for the tremendous ordeal of the second stage of labor. Going back to the original Greek, we find that the word obstetrician means one who " stands by " his patient. He is a poor doctor and she a poor nurse who is so absorbed in scientific or technical study as to forget this meaning.

Attention to the Fœtus.—The attendant should never forget that he has two patients instead of one, and that he is responsible for the patient whom he cannot see as well as for the patient whom he can see. Therefore he should auscultate the fetal heart at intervals during the entire course of labor. In operative cases, in premature rupture of the membranes, or whenever any complication is present, he should be especially

careful. The mother is always grateful for any evidence of interest in the child, and there is no doubt that now and then the timely recognition of impending asphyxia may result in the saving of fetal life. This is especially true of delayed second stage. Should the attendant have reason to fear for the welfare of the child, it is not wise to tell the mother, but for his own protection he should inform some member of the family.

The general subject of the auscultation of the fetal heart has already been dealt with, but it may be well again to remind the reader that in the second stage of labor, when the recognition of the fetal heart sounds is most important, they are best heard in the median line, an inch or two above the symphysis. It has been my observation that many men forget the self-evident fact that with the descent and forward rotation of the fœtus there is a corresponding change in the location of the maximum intensity of the fetal heart sounds.

It is of the utmost importance that the physician should, early in his career, become accustomed to the auscultation of the fetal heart, both with and without the stethoscope. *But no man whose sense of hearing is unimpaired is too old to learn.*

This auscultation of the fetal heart is of special importance in delayed second stage when the head is well down in the pelvic cavity and interference is easy and attended with little danger to the mother. The mere fact that one cannot hear the fetal heart is of less significance than a slowing or irregularity in sounds that have previously been normal. This subject will be further considered in the chapter on fetal asphyxia.

The care of the child's eyes and the first dressing of the umbilical cord should be regarded as important parts of the management of labor, to be entrusted to the physician, or at all events to be performed under his direct supervision.

Ligation and Care of the Cord.—As soon as the head is born, the attendant should determine by touch whether the cord is wound about the neck of the child, and, if it is, a loop or more, if present, should be drawn over the head. Some writers advise that if this cannot be done, the cord should be ligated and severed and the child rapidly delivered. I have never felt obliged to do this, though I must admit having torn the cord two or three times, fortunately without harm. If one should ligate the cord and then find difficulty in extracting the child, the position would be an awkward one.

The cord should not be ligated until pulsation has ceased. If it is ligated at once the child loses some of the reserve blood of the placenta which it would otherwise receive. After the pulsation has ceased or has become very faint, the cord is ligated about an inch and one-half from the abdominal surface. It is always wise to leave the stump long enough for a second ligature should this prove necessary. Only what is sterile should be allowed to approach. The stump should then be well covered with sterile gauze or cotton and thus protected until the cord is dressed.

The first dressing of the cord is a very important matter. If there is a well-trained nurse in attendance it may be entrusted to her, but otherwise it should be performed by the physician himself. Under no circumstances should this task be entrusted to an ignorant bystander or an untrained nurse. Serious and even fatal consequences may follow.

Various complicated methods have been devised. No one of them is essential. Simple asepsis is all that is necessary. The hands that handle the cord should be gloved and the scissors with which it is cut and the tape with which it is tied should be sterile. The use of irritating chemical solutions probably does more harm than good. After it has been ligated it should be wrapped in sterile absorbent cotton, which tends to absorb any moisture and to promote prompt desiccation and separation, and wrapped in sterile gauze. The whole should be kept in place by a band about the abdomen which should be so arranged as to keep the cord dressings securely in place without interfering with respiration. On no account should the child be given a tub bath at this time. This practice, so common among nursery wiseacres, is a fruitful source of infection. Such a bath should be deferred until after the cord has separated.

Prophylaxis of Gonorrhœal Ophthalmia.—Another duty of the attendant at this time, and one which should on no account be neglected, is the prophylactic instillation of silver solution into the eyes of the child. Bitter regret has more than once been the portion of the man who supposed that he knew the history of both parents too well to be deceived. It should not be forgotten that many an innocent woman is the unconscious victim of gonorrhœa.

The formula is easy to remember. One drop of a one per cent. solution in each eye. Neutralization with salt solution is superfluous. The one per cent. solution seems to be effective without producing the rather severe reaction that sometimes follows the use of the two per cent. solution originally proposed and used by Credé. Argyrol in 25 per cent. solution is less irritating and is said to be equally effective.

Management of the Third Stage

With the delivery of the child begins the third stage of labor. I am accustomed to consider its management under three heads:

1. The prevention of infection.
2. The prevention of hemorrhage.
3. The supervision of the expulsion of the placenta and membranes.

As to the prevention of infection, the principles and methods of disinfection are, of course, the same as at previous periods of labor, but the necessity for noninterference is obviously much greater. While unnecessary examinations and manipulations are objectionable before delivery, they are doubly so afterward, when a multitude of small lacerations and abrasions, which soon heal if left alone, offer as many avenues for the introduction of sepsis.

Some obstetricians advise that the cervix be inspected and, if necessary, repaired immediately after delivery. This is, of course, imperative if the tear is large enough to cause hemorrhage, and it is perhaps wise after versions and high or mid-forceps operations if the surroundings are favorable and the patient's condition warrants it; but its routine adoption in normal labor would, in my opinion, do more harm than good. Bad tears of the cervix are not common in normal labor, and moderate tears often sink into insignificance during involution.

Perineal lacerations that endanger the integrity of the pelvic floor, of course, require immediate repair, and the same statement applies to the larger superficial lacerations of the perineum. These, however, occur chiefly in primiparæ, and little internal manipulation is necessary to determine their presence. To distend the cervicovaginal canal in search of small tears whose edges are in apposition and have no tendency to separate, would be ludicrous, if it were not so dangerous.

The traditional postpartum douche is happily a thing of the past. Here again the efforts of nature are superior to those of art. Not only are the vaginal secretions antagonistic to the germs of infection, as Döderlein and others have shown, but after delivery the entire birth canal is flooded with blood and liquor amnii, which some one has not inaptly called a normal salt solution, and the fœtus and placenta, both aseptic, are during their emergence, at all times, closely embraced by the contracting ostium vaginæ, so that neither air nor foreign body can enter. Here there is clearly no reason for a postpartum douche unless some enterprising person has given an antepartum douche. Clinical experience confirms this view.

The practice of inserting the fingers into the vagina in search of placenta or membranes is, as we shall presently see, a bad one, and is seldom necessary in the hands of the man who has learned how to manage the third stage of labor. In ordinary cases the genital canal should be let alone after delivery unless laceration or hemorrhage make interference necessary. In such cases rubber gloves should always be worn.

After the expulsion of the placenta and membranes, the parts are irrigated from above downward with lysol or bichloride solution and covered with a large pad of sterile absorbent cotton which is held in place by a dry dressing fastened to the binder in front and behind. After all first labors, operative deliveries, and perineorrhaphies it is my custom to have this cotton pad wrung out of a weak antiseptic solution (one per cent. lysol) and applied moist to the vulva. After much bruising or laceration of the parts, nothing is more grateful to the patient than a hot moist compress. This compress also serves to promote drainage, and probably to exclude infection, and may be continued for the first two or three days.

If there is no trained nurse at hand, *it is the bounden duty of the physician to make the first vulvar dressing himself*. This takes no extra time, since he should not leave his patient for an hour in any event, and in so doing he assures himself that, during the first few hours after delivery, the

time when infection is most likely to occur, and when if it does occur it is most likely to be of the severe type, his patient is protected. There is no doubt that many infections have their origin at this time. To maintain careful asepsis during the first and second stages of labor, and turn the patient over at the most critical period to the attentions of her family and friends, is a reversal of the ordinary processes of logic.

The nurse should be instructed not to remove this first dressing until the patient is obliged to urinate, after which a new dressing should be applied. She is also carefully instructed in the manner of making the subsequent dressings, as described in the next chapter.

We endeavor, then, to prevent infection during the third stage by scrupulous cleanliness, avoidance of all internal manipulations that are not clearly indicated and by particular attention to the first vulvar dressing.

The prevention of hemorrhage and the supervision of placental expulsion are considered together. During the delivery of the fœtus the fundus should be followed down by the hand of the accoucheur and the behavior of the uterus carefully noted. If all is well it will be felt as a hard ball, above the symphysis, but well below the umbilicus. If it is so felt, and if there is no hemorrhage from the vagina, further manipulation is better omitted, but the hand should be kept in position and the uterus carefully watched. If there is a tendency to relaxation, the uterus should be massaged by a rotary movement, made with the tips of the fingers applied over the fundus, until it becomes hard again.

It is a great mistake, however, needlessly to irritate an already contracted uterus by constantly rubbing and massaging it, and making premature and repeated efforts at expulsion of the placenta. In this way there is often produced a tetanic contraction of the uterus, as harmful, while it lasts, as that produced by ergot and often causing retention of the placenta. This is a very common mistake of the young practitioner. The term "holding the fundus" should be expunged from our hospital vocabulary, and the term "watching the fundus" substituted. The fundus should be *watched,* however, for at least an hour after the expulsion of the placenta, or, better, two hours. Of course this is usually unnecessary, but it should never be omitted. Sudden relaxation and severe hemorrhage may occur most unexpectedly, even after a perfectly normal labor.

Too often both doctor and nurse seem to think that with the birth of the child the necessity for watchfulness is over. This is a great mistake. In the average case the two hours following delivery constitute, as far as treatment is concerned, by far the most important part of the whole parturient process.

In some cases the placenta follows the child immediately, but this is the exception. As a rule, it is from five or ten minutes to a half-hour before the placenta is either wholly or partly in the vagina, and this is indicated by the fact that the fundus rises above the umbilicus without, however, becoming relaxed or soft. This sign, emphasized by Whitridge

Williams, I have found of much practical value. When the fundus has risen in this manner, it is usually easy to express the placenta by simply pressing the uterus downward and forward in the axis of the brim (Figs. 123 and 124).

As long as the uterus remains firmly contracted below the umbilicus the placenta is probably still undetached, but I have occasionally noted exceptions to this rule.

If, however, moderate pressure does not avail, or if the uterus remains firmly contracted above the symphysis and does not change its position, it is better to wait from half an hour to an hour before attempting to express the placenta. On the whole, there is a general tendency to

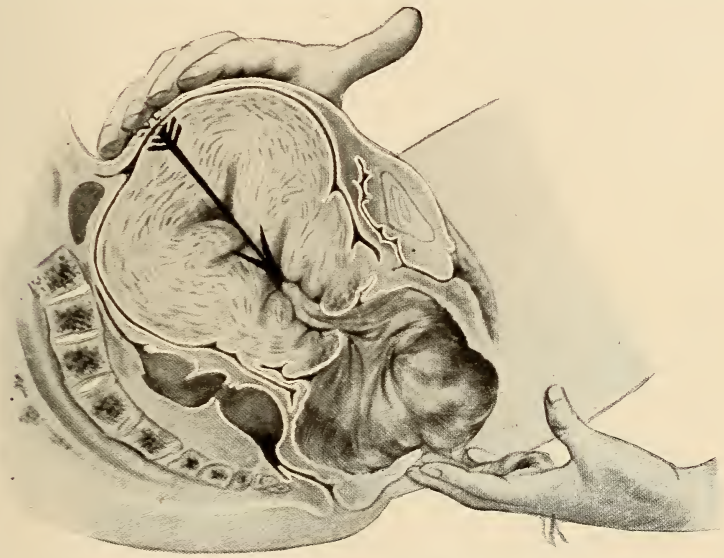

FIG. 123.—Expulsion of placenta aided by pressure over fundus after complete separation.

hasten unduly the termination of the third stage of labor. Not only do premature efforts in this direction cause tetanic spasm of the uterus, as already mentioned, but, even if successful, they disturb the normal mechanism of placental expulsion, prevent the formation of the retro-placental hæmatoma, and thus, by a strange irony of fate, hemorrhage, placental retention, and infection are caused by the very means employed to prevent them. But the uterus must be watched meanwhile.

We cannot, however, wait indefinitely for the expulsion of the placenta. If no progress has been made in from half an hour to an hour it should be expressed by the Dublin method, generally known as the method of Credé, which is well illustrated in Fig. 125. The operator waits for a contraction, or, if one is not forthcoming he produces one by light massage of the fundus. As the contraction reaches its height the four fingers behind the uterus

and the thumb in front make pressure directly downward, *i.e.*, toward the floor, while the placenta is at the same time squeezed from the uterus as a cherry-pit is squeezed from a cherry. Sometimes the uterus is so large that it can hardly be grasped in one hand. In this case two hands may be used, eight fingers behind and two thumbs in front. Credé's method requires a little practice, but once learned, it will be found of great value.

Two very common mistakes must be avoided. Be sure that the uterus is contracting before you undertake expression. Make pressure directly downward in the axis of the pelvic brim. The beginner almost invariably makes pressure forward, compressing the uterus against the symphysis. This hurts the patient and does no good whatever.

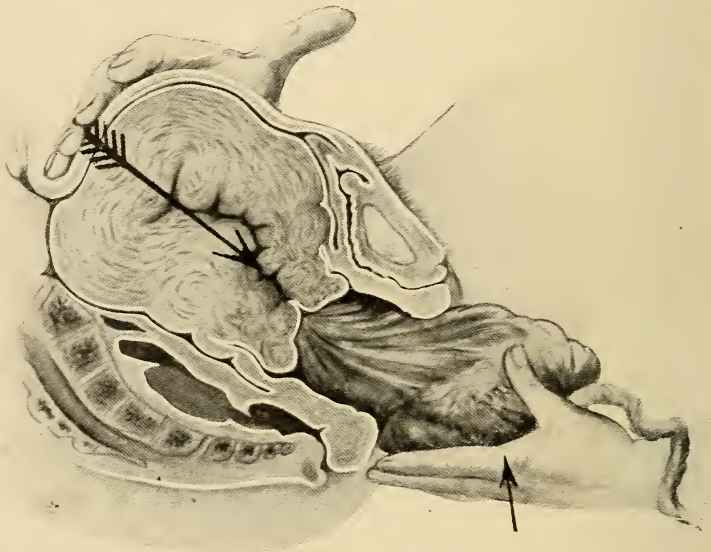

FIG. 124.—Placenta and membranes fall into the hand.

Credé's method is not to be used in every case, but only in case of hemorrhage, or when the usual methods have failed and from half an hour to an hour has elapsed since the birth of the child. *It is a measure of necessity, not of choice.* It is sometimes quite painful, and repeated efforts may induce considerable shock. Used too early it disturbs the normal mechanism of labor and tends to cause, rather than to prevent, hemorrhage. But properly employed it has great advantages. In case of hemorrhage or obstinate placental retention, it enables the operator to empty the uterus without introducing the hand, thus greatly lessening the danger of infection.

It is an invaluable expedient, to be reserved for certain cases of emergency. To practise it as a matter of routine or convenience in every case is a dangerous blunder.

Adherent placenta, *i.e.*, attachment of the placenta to the uterine wall, is very rare, and, when it does occur, is usually a concomitant of syphilis. In cases of true adherent placenta, it may be necessary to introduce the

FIG. 125.—Expressing the placenta by the method of Credé.

hand into the uterus and separate the placenta from the uterine wall. Manual removal of the placenta may also be indicated in cases of hemorrhage if the placenta is still *in utero* and Credé's method is not promptly successful. But it may be taken for granted that the man who reports

many cases of adherent placenta, or who often finds it necessary to introduce his hand into the uterus, has yet to learn the management of the third stage of labor.

When the placenta has passed the orifice of the vulva, it is revolved a few times in the hands, in order that the membranes may be twisted

FIG. 126. Twisting the membrane into the form of a rope to prevent tearing.

into the form of a rope and thus be less likely to tear (Fig. 126). This procedure has been criticised of late, but after a large experience I am convinced that it is very useful. The placenta is twisted rather than pulled, little or no traction being made (Fig. 127).

The placenta and membranes should always be carefully inspected to make sure that nothing has been left behind. After looking over the

maternal surface the placental border should be inspected. Torn vessels indicate the existence of a placenta succenturiata. If the beginner would see how a placenta looks when one or more cotyledons are missing, let him remove them from a normal placenta and then study the mutilated

FIG. 127.—Inspecting the placenta.

organ. Masses of retained placenta, of course, require removal. If attached to the uterine wall they prevent involution, keep the sinuses open, thus favoring infection, and sometimes causing profuse hemorrhage hours or even days after delivery.

The retention of pieces of membrane or even the whole chorion is of no great importance. At all events, it is a lesser evil than the introduction of the hand into the uterus for their removal. Such fragments usually come away in a few days without causing any great trouble.

If there has been a slight or moderate tear of the perineum, the physician may, while waiting for the delivery of the placenta, employ his time in placing the sutures, taking advantage of the fact that the patient is still perhaps under the influence of the anæsthetic, but they should not be tied until the placenta has been expressed. Only tears of the first degree can be properly repaired at this time. . . .

The Preservation of the Perineum.—This is one of the most important duties of the accoucheur. Neglect or ignorance in this particular may condemn a patient to a life of chronic invalidism. Why and how this happens are questions that are answered in text-books on gynæcology and need not concern us here, but the fact remains not to be forgotten.

Frequency.—Statistics on this point are very misleading. Perineal tears vary in frequency according to the skill of the obstetrician. In a general way, however, we may say that under average management tears involving more or less of the perineal body occur in about twenty-five per cent. of primiparæ and in about five per cent. of multiparæ, while tears of the fourchette are found in the great majority of cases.

Varieties.—Excluding mere "nicks," or tears of the fourchette only, perineal tears are conveniently divided into those of the first, second, and third degrees.

First degree tears involve the fourchette and more or less of the perineal skin and vaginal mucous membrane.

Second degree tears are those in which more or less of the perineal body is involved but which do not include the sphincter ani. These tears usually extend up one or the other vaginal sulcus, dividing the levator ani to a greater or less extent.

Third degree tears are those which divide the sphincter, and, usually, more or less of the rectovaginal septum.

Causes of Perineal Laceration.—What are the causes of perineal laceration? We must be able to answer this question before we can formulate any intelligent scheme of prevention.

The most common cause is rapid and sudden expulsion of the head. It is a matter of common observation that when the head is suddenly expelled at the height of a contraction a tear usually results. Next in frequency perhaps is unusual disproportion between the head and the soft parts of the mother. In certain women who are often, but by no means always, elderly primiparæ, the tissues are so friable that they will tear, no matter how skilfully the case is conducted.

As a rule the worst tears occur in operative cases, especially in unskilfully conducted forceps operations.

In breech extractions, if there is much disproportion in size between

the fœtus and the maternal parts, lacerations are common and sometimes quite unavoidable.

When the symphysis is long and the pubic arch narrow, the head may be directed so far backward that rupture is inevitable, and the same thing may happen in cases of outlet contraction, or of abnormal pelvic inclination. As might be expected, laceration is more frequent in malpositions and malpresentations. Instances will at once occur to the reader. Perhaps the most common is posterior position of the occiput. A small part prolapsed alongside of the head obviously increases the danger. Not very infrequently one encounters a hand in this position.

Finally, faulty technic in the delivery of the shoulders is not to be forgotten.

Since tears occur five times as often in primiparæ, it is evident that primiparity is a predisposing cause.

Care of the Perineum.—The reader will note at once that some of these causes are preventable, *e.g.,* we can and should control the progress of the head, and we can and should learn to perform our forceps operations with deliberation and skill. On the other hand, we cannot help the friability of the tissues or the shape of the pubic arch. It follows, of course, that the attendant is not responsible for all tears of the perineum. In many cases no blame whatever can be attached to him. He can be blamed, however, and probably will be blamed if he makes no attempt to repair the laceration. This should never be forgotten. Nor should he forget that, if for any good reason he does not feel like undertaking an immediate repair, the operation can be performed just as well, or perhaps better, the next day. Indeed, there are certain undeniable advantages in performing the operation from twelve to thirty-six hours after delivery.

Many a patient has been denied the advantage of perineal repair because her physician very properly hesitated to risk additional shock after a severe operation or a profuse hemorrhage, but did not appreciate the opportunity of operating a day or two after labor. All this, however, will be considered in connection with the repair of perineal lacerations.

The physician should remain with his patient for at least an hour after the delivery of the placenta. In cases of uterine relaxation, in cardiac cases, after severe operations, or prolonged anæsthesia, and in all doubtful or critical cases, the time should be extended to at least two hours. Before taking his leave he should satisfy himself that his patient is clean and comfortable and that hemorrhage is not going on. In all doubtful cases at least this latter point should be settled by actual inspection since, as we shall see later, severe bleeding may occur when the fundus is well contracted, *e.g.,* after laceration of the cervix or placenta prævia. If the patient is in a hospital it is wise to leave express and emphatic orders that the patient be not catheterized except by direction of the attending physician. Unnecessary catheterization done as a matter of routine has often led to deplorable results. But of this more in a subsequent chapter.

CHAPTER IX

THE PHYSIOLOGY AND CLINICAL HISTORY OF THE PUERPERIUM

The puerperium, or lying-in period, comprises the period extending from the end of labor until the organs and tissues concerned in the child-bearing process have returned to their normal condition. To be sure, their condition after labor is never exactly the same as before, but this we have already considered. Strictly speaking, this would mean from six weeks to two months. According to general custom, however, the patient remains under the care of her physician about as long as she remains in bed, *i.e.,* from ten days to three or four weeks. Of course, this custom is not a good one. In cases that are in all respects normal it may answer well enough, but no one can be sure of such cases in advance. It is far better that the patient be under the observation of her physician for a month after delivery. But, before we come to the management of this period, we must consider the phenomena which normally accompany it. These phenomena are not only of great practical importance, but are highly interesting as well.

Involution of the Uterus.—At the close of labor the uterus, which still occupies a large part of the abdominal cavity and weighs a thousand grammes or more, must be reduced to something like its original size and weight, and be hidden again within the pelvic cavity. How is this accomplished?

It was formerly supposed that the entire uterine muscle is dissolved and cast off, the patient being provided as it were with a new uterus after each labor. It remained for Robin and Sanger to point out the fallacy of this conclusion, and to show that the primitive fibres remain to form perhaps the starting points for another hypertrophic process in a future pregnancy. It is for the most part only the unnecessary protoplasm that is removed.

The process is principally one of fatty degeneration, and is caused by the constriction of the blood-vessels which supply the uterine muscle, and the consequent cutting off of its blood supply. The contractions of the uterus, which continue after delivery as well as before, have other objects than the prevention of hemorrhage. Of course the uterine connective tissue is also involved but its amount is relatively so small that this is of minor importance.

During the latter part of pregnancy, the way is prepared for the final separation of the placenta and membranes, by fatty degeneration in the glandular layer of the vera and reflexa. After the completion of the third stage of labor nothing is left but the deepest portion of the decidua

containing connective and glandular tissue. There is an active leucocytosis with the formation of a granulation layer, necrosis and casting off with the lochia of the outer cellular layer, and preservation of the deeper glandular layer, from which the regenerated endometrium is to be formed. This formation is brought about by proliferation of gland and connective-tissue cells and aided by the constant diminution in the size of the uterus and therefore of the area to be reconstructed.

Wounds of the cervix, vagina and perineum heal, or fail to heal, much as do wounds of mucous membrane under other circumstances, and the process requires no special description. In its gross features it is familiar

FIG. 128.—Frozen section just after completion of third stage of labor, showing collapse of lower uterine segment and cervix. *C. R.*, contraction ring; *O. E.*, external os; *O. I.*, internal os. (After Benckiser.)

to all who have taken the trouble to watch their postpartum cases with care.

CHARACTERISTICS OF THE POSTPARTUM UTERUS.—There are two characteristic features of the postpartum uterus which should be constantly kept in mind if one would understand the phenomena of the puerperium—its extreme mobility, and its marked anteflexion. The thin, relaxed, lower uterine segment offers no resistance to movement in any direction, and the normal anteflexion of the uterus is much more marked at this time and increases from day to day. The large and heavy fundus falls forward, making a pronounced angle with the cervix. Indeed, so sharp is this angle in some cases, that the lochial discharge is arrested. In cases with a tendency to retroversion the fundus may fall backward. This

condition called by the Germans *lochiometra* will engage our attention later. There is a tendency for posterior displacements to be exaggerated. Prolapse of the uterus too often dates from this time.

The great mobility of the puerperal uterus is strikingly shown by the

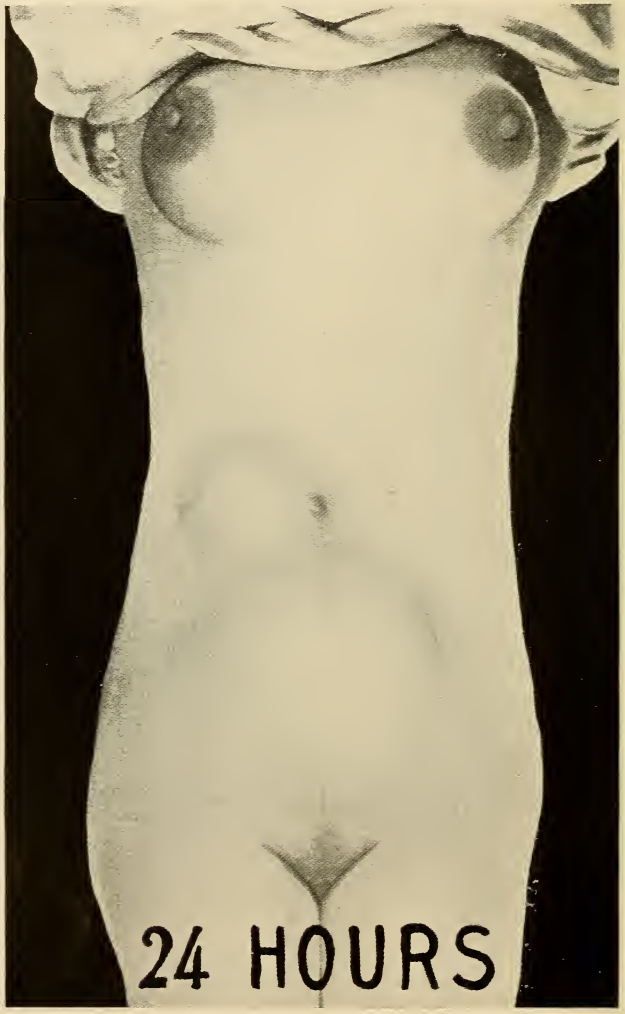

FIG. 129.—Position of fundus of uterus twenty-four hours after labor.

changes of position which it undergoes with the alternate filling and emptying of the bladder. There is a somewhat similar, though less striking, change attendant upon the distention of the rectum. According to Fabre the fundus ascends one centimetre for every one hundred grammes of

urine in the bladder, while a full rectum causes it to ascend three centimetres. From this it is sufficiently evident that we cannot draw conclusions from the height of the fundus unless we know the condition of the bladder and rectum, especially the former.

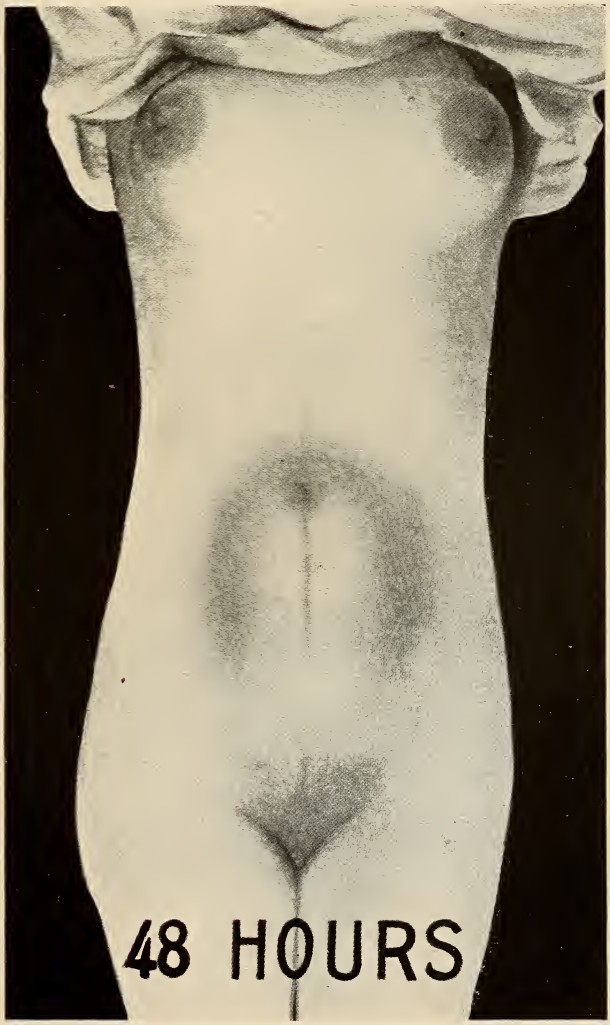

FIG. 130.—Position of fundus of uterus forty-eight hours after labor.

Immediately after the completion of the third stage of labor the uterus should be found well contracted and below the level of the umbilicus. If the physician examines the patient the next morning the fundus will be found in the region of the liver (Figs. 128 and 129). Sometimes, much

less often, the fundus will be found at the same height but upon the left side in the neighborhood of the spleen. It is only in rare instances that it is found in the median line. This change of position is due to the distention of the bladder which is uniformly present at this time. On the second day the fundus is at a lower level owing to the fact that the bladder has been emptied (Figs. 130 and 131). On the following day the fact that the rectum has been emptied has aided in the continued descent of the fundus (Fig. 132).

Moreover, there is another fact that it is necessary to bear in mind. The puerperal uterus is no longer a cavity. The cavity has been emptied and the walls are in contact. At least this is the normal condition. The

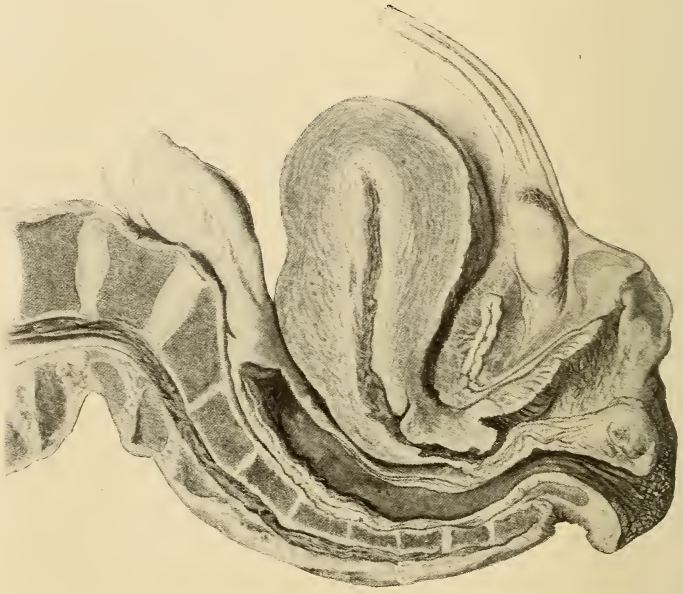

Fig. 131.—Sagittal section of the pelvic organs of a puerpera on the second day after delivery. (Ahlfeld.)

lax uterus of a multipara does not contract as well as does that of a primipara. Hence the greater frequency of "after pains," which are really nothing more nor less than the efforts of a lax uterus to expel a blood clot.

The interior of the uterus is smooth except at the placental site where there is a distinct roughness due to the presence of thrombi in the vessels. The student and practitioner is usually left to find this out for himself, to assume in other words that the uterine interior is uniformly smooth, a serious error on the part of his teachers. The result of an effort to remove it with the curette (and such efforts have been occasionally made) may be better imagined than described.

Involution of Cervix and Vagina.—Immediately after delivery the cervix is hardly recognizable as a cervix. At least, this is true of all primiparous labors and of all difficult and operative cases. Apparently this fact is not generally known. It is keenly appreciated, however, by

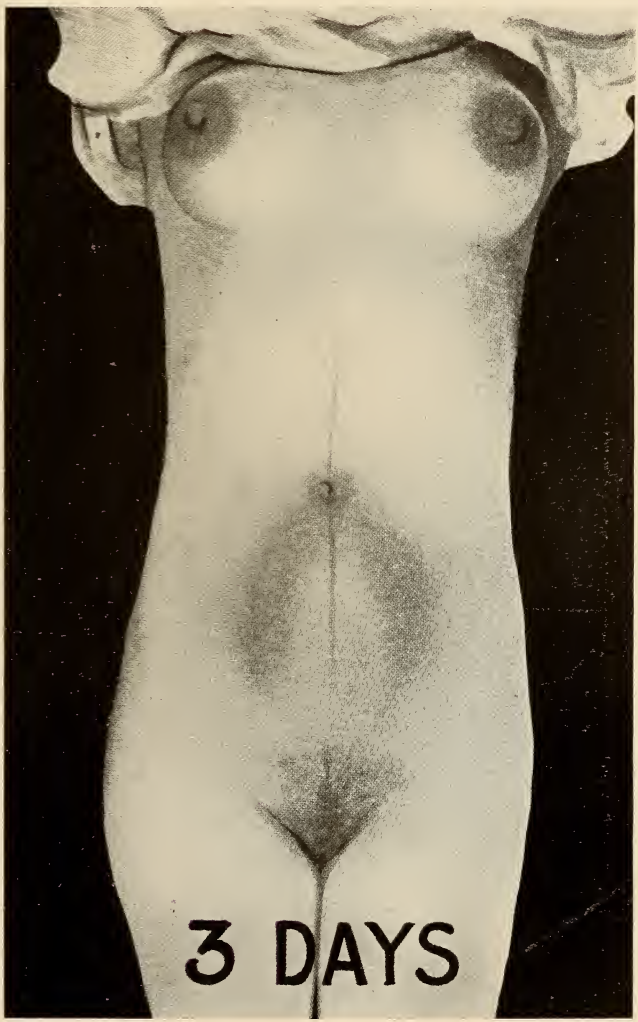

FIG. 132.—Position of fundus of uterus three days after labor.

those who have been called to sew up a cervical tear in order to stop hemorrhage.

Despite all this, the cervix soon shows signs of progressive return to the normal. The internal os is first to regain something like its natural

form and dimensions. It contracts with remarkable rapidity and at the end of three days hardly admits two fingers. By the third week the cervix is closed, not even admitting the finger. All this, of course, only if conditions are normal. In cases of subinvolution or infection, and especially of retained secundines, the cervix often admits the finger even during the third or fourth week.

Immediately after delivery the ostium vaginæ is completely relaxed

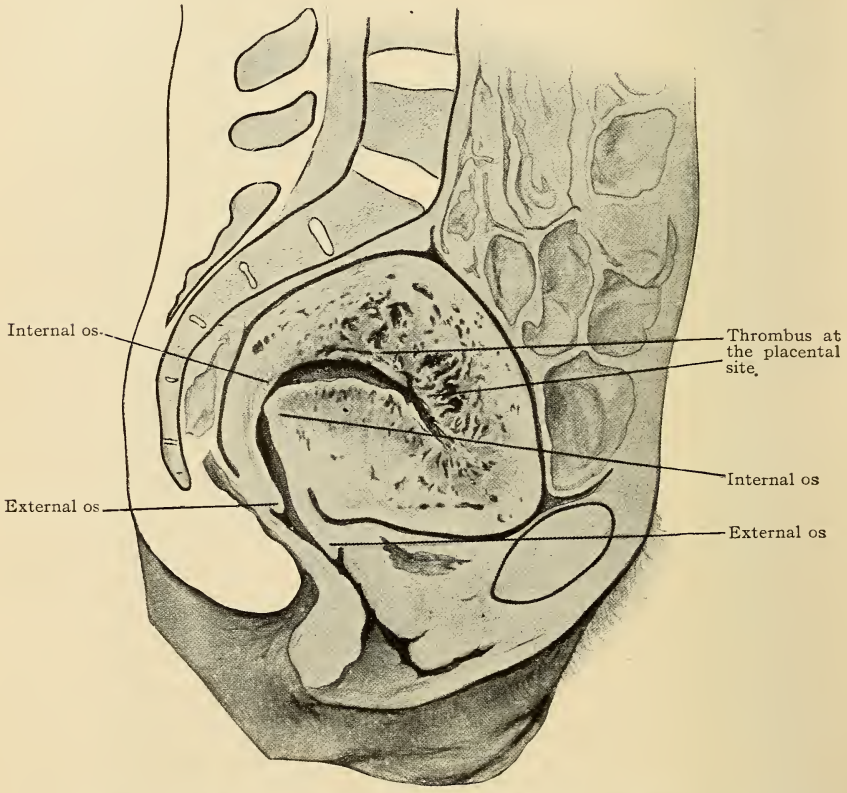

Fig. 133.—Puerperal uterus of the fifth day. After a frozen section of the Basel clinic. Internal os closed, external os and cervical canal still gaping.

and offers no resistance to the introduction of the fingers. There is no suggestion of a sphincter. In a day or two, however, contraction begins, and from this time on the vagina gains rapidly in tone and contractile power. A certain friability of the tissues, however, persists for some weeks. They tear rather than stretch, and are more vascular than usual. This fact has been noted and emphasized by DeLee, and is well worth remembering. He quotes reports of many cases of injury with severe

bleeding occurring during too early coitus. Bleeding was always a prominent symptom.

The Descent of the Fundus.—The descent of the uterus continues for ten or twelve days at the rate of about one centimetre per day until it can no longer be felt above the symphysis. This period is not uniform, however. In easy cases the period may be a day or two shorter, whereas in

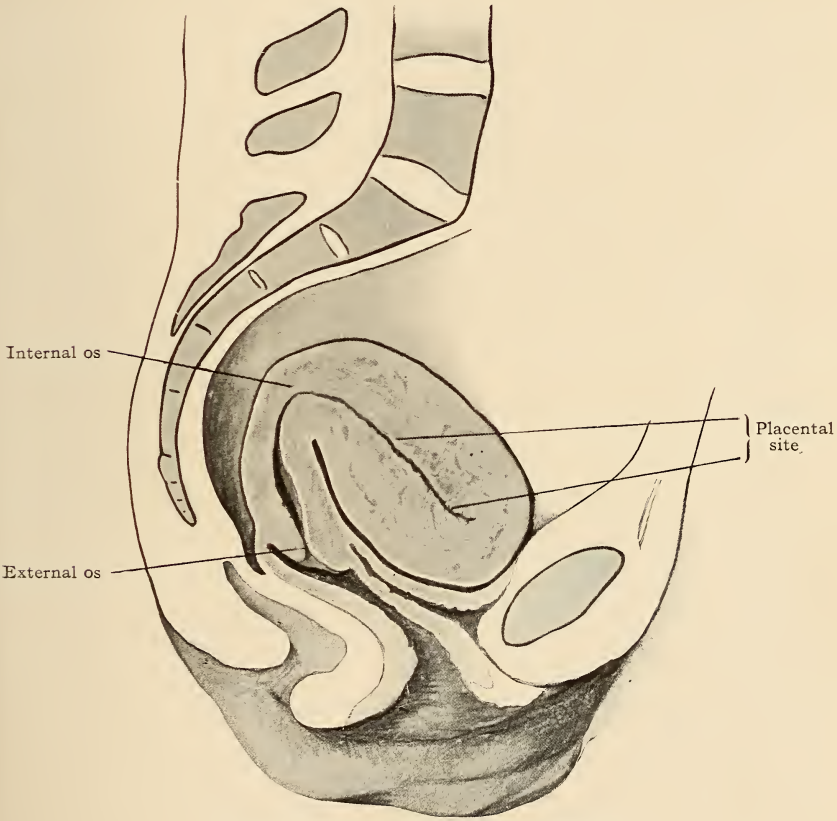

Fig. 134.—Puerperal uterus of the twelfth day.

difficult cases or in cases of sepsis or subinvolution it may be very much longer (Figs. 133 and 134).

Clinical Course of the Puerperium

The Postpartum Chill.—The third stage of labor is often followed by a well-marked chill, which is a common source of alarm to the inexperienced; but is of no clinical significance. It is probably of vasomotor origin, and due to the recession of a large quantity of blood from the

superficial vessels, though the loss of blood and the inevitable exposure following the exertions of the second stage doubtless contribute their part. I have been struck by the fact that it is much more common in the case of patients delivered at home than in the warm air and equable temperature of the hospital delivery room.

The Temperature.—As a rule the temperature should not be higher during the lying-in period than at other times. There are occasional exceptions, however. After long and difficult labors, and especially after operative deliveries, the temperature may rise to 100°, or thereabouts, without any special acceleration of the pulse or other special symptoms, only to fall again within the next twelve hours.

After difficult obstetric operations the temperature may rise immediately to 101½° or 102° and remain at that point for two or three days. This is variously attributed to shock, mild infection, or some unknown influences. There is usually a corresponding acceleration of the pulse, together with some evidences of shock.

The subject of septic and nonseptic causes of fever is discussed in the chapter on puerperal infection.

The Pulse.—The slow pulse of the puerperium is proverbial. It is usually between sixty and seventy, though in some cases it becomes even slower, perhaps forty or fifty. I believe there is no doubt of the existence of this phenomenon, though one observer came to the curious conclusion that the pulse is actually more rapid during the puerperium than before.

Various reasons have been adduced for the slow pulse of the puerperium. To me the fact that the work to which the heart has gradually become accustomed is suddenly and markedly reduced by the discontinuance of the utero placental circulation, is altogether the most plausible. Additional factors, no doubt, are rest in bed and a restricted diet which, during the lying-in period, as at other times, tend to reduce the rapidity of the heart's action.

The Bladder.—Sluggish action of the bladder is common during the puerperium, and the condition is still further aggravated by the fact that the urinary secretion at this time is greater than usual. The chief factors in causing retention are the recumbent position and the bruising and swelling of the urethra and adjacent structures. Contributing factors are spasm of the urethra, nervousness, lowered intra-abdominal pressure, and weakness and relaxation of the abdominal muscles. The very important subject of the treatment of this condition will be discussed in the next chapter.

The Bowels.—Constipation for the first few days is the rule. The recumbent position, paralysis of the intestinal muscles from pressure, and weakness of the abdominal muscles from the exertions of labor, are among the causes. Probably the recumbent position and the traditional milk toast and tea are chiefly at fault.

The Skin.—Elimination by the skin is active at this time. The

patient perspires freely at night, and perhaps complains of the "night-sweats," to which she is subject. The surface of the body is cool and moist. Frequent bathing is appreciated. A dry skin is not of good omen at this time. It may mean fever or toxæmia.

The Nervous System.—The nervous system is more or less affected, especially in sensitive and impressionable women. Emotional crises are easily brought about. DeLee says that puerperæ hear more acutely, and are unusually sensitive to lights and odors. They are certainly very sensitive to petty annoyances and to real or fancied slights. All this is accentuated by the patient's feelings of helplessness. Transient rapidity of the pulse and irregular elevations of temperature are easily excited. On the other hand, there are many women of phlegmatic temperament who regard the whole matter with equanimity.

Appetite.—The appetite is said to be diminished. I do not think that this is true except as far as circumstances, *e.g.,* confinement to the house and bed, make it so. In my experience it has been quite common for the patient to ask for something to eat shortly after delivery.

Thirst is marked both before and after delivery. Before delivery it is caused by the exertion of the second stage and the parched and dry condition of the mouth and throat that accompanies it and that soon becomes familiar to every observer. After delivery, and during the days that follow, it is the result of the hemorrhage that occurs at the close of labor and of the free elimination and excretion that follow.

Weight.—When the starvation diet was in vogue the patients lost considerable weight during the puerperium. Gasser found an average loss of 4500 grammes during the first week. Others estimated it as one-tenth of the total body weight. In these days of more liberal diet the amount is much less, though when the patient first leaves her bed the loss of flesh is usually perceptible. Many patients gain in weight after the first few weeks have passed.

The Lochia.—This is the technical name for the vaginal discharge which continues for some weeks after delivery and which serves the purpose of ridding the uterus of the deeper decidual layer and of various other débris which must be gotten rid of in the process of involution. The classification of the older writers is still convenient and useful. For the first three days the discharge is largely mixed with blood, the *lochia rubra.* During the next few days there is a large admixture of serum, the *lochia serosa.* After this, owing to the presence of leucocytes in large numbers, the discharge becomes whitish, the *lochia alba.* It disappears as a rule in two or three weeks. In easy cases it may disappear earlier; while in more difficult cases, *e.g.,* in primiparæ, or after operative or complicated deliveries, its duration is greater.

If the patient leaves her bed and resumes her household duties early, perhaps about the tenth day, the discharge becomes red again from the

admixture of blood due to the reopening of small wounds that have not quite healed, the *lochia cruenta* of the older writers.

The cessation of the lochial discharge marks the regeneration of the uterine mucous membrane and is of course a favorable prognostic. Its long continuance is of less favorable import, denoting perhaps infection or subinvolution. It may be caused by retention of some part of the secundines. This is very common after abortions.

Whether the normal uterine lochia contain virulent pyogenic organisms and may thus become the source of infection has been much debated. Personally I believe that Krönig and Williams are right in maintaining that this is not the case. At all events this seems to be indicated by the fact that with proper precautions infection is of the rarest occurrence. All observers agree, however, that pathogenic organisms inhabit the lower part of the vagina and are found in abundance about the vulva. But more of this subject when we come to discuss the subject of puerperal infection. A bad odor with the lochia may be an indication of sapræmia, or, more rarely, of a severe type of infection; or, it may be simply the result of lack of external cleanliness.

The lochial fluid is alkaline in reaction. During the first few days its characteristics are largely those of the blood with which it is so freely admixed. Microscopic examination shows the presence of red corpuscles, leucocytes, and epithelial and decidual débris. Later the discharge consists largely of serum from the mucous membrane as in the healing of mucous surfaces in other parts of the body. The white color of the *lochia alba* is due to the plentiful admixture of leucocytes. Much printer's ink has been wasted in the effort to describe the odor of the lochia, but this can only be learned by experience.

Tympanites.—A moderate degree of tympanites is an accompaniment of the puerperium. It is more noticeable after long and difficult labors and operative deliveries. It is probably due partly to paresis of the bowel from pressure and partly to constipation and the accompanying fermentation. It is more noticeable after difficult operative deliveries, and is common after the Cæsarean section, especially when the operation is performed late in labor. In pronounced cases the distention is so great as to cause anxiety, but if peritonitis or other serious complication is absent the patients usually recover.

The Blood.—On the whole there is little change in the blood at this time. Most common is a moderate anæmia with the usual diminution in the amount of red corpuscles and of hæmoglobin. The patient looks as though she had had a moderate hemorrhage, as is indeed the truth. There is one fact, however, which should never be forgotten. During labor and for a few days thereafter a marked leucocytosis can be demonstrated. This fact which we owe to Hofbauer, and of which many are apparently ignorant, is of importance from the standpoint of diagnosis. It is often adduced as an evidence of infection when in reality it is nothing of the

sort, and incidentally it may in this way lead to undeserved censure of the medical attendant.

The Urine.—We have already noted that the quantity of urine is increased at this time. Small quantities of albumen are often found in the urine during the first few days after delivery. They are probably the result of the muscular exertion of labor, as they are often the result of muscular efforts of other kinds. Sugar, too, may be found in small quantities in a large proportion of recently delivered women. Acetonuria is common, and is probably a starvation anuria, like that of the vomiting of pregnancy. To my mind it indicates a more liberal diet than is usually allowed. Peptonuria is constant during the lying-in period, and is doubtless the result of the absorption of albuminous matter, which is a necessary accompaniment of uterine involution.

On the whole the presence of small amounts of sugar or albumen, unaccompanied by symptoms, need not cause alarm at this time. It is difficult to secure a clear specimen without the use of the catheter and, owing to the danger of cystitis, this is hardly justifiable.

Probably the products of retrograde change are chiefly excreted by the kidneys, although we must not forget that other excretory organs, notably the skin, are active at this time. Williams has made the highly interesting observation that the usual marked increase in the nitrogen excretion which accompanies the early days of the puerperium is absent in patients who have been submitted to hysterectomy.

Lactation.—On the third or fourth day, sometimes a day or two earlier or later, the familiar phenomena of lactation are observed. These are described elsewhere and need not detain us long. The breasts become distended and there are "prickling" sensations, with moderate pain and tenderness, and considerable enlargement of the axillary glands. Upon certain phlegmatic women of a type with which we are all familiar, these symptoms make little or no impression. In nervous and hypersensitive patients they may be the cause of acute distress. It was formerly supposed that the establishment of the milk secretion is physiologically attended by fever. This we now know to be untrue.

In the lower animals milk appears in the breasts at the time of delivery. Why is its appearance delayed in the female of the human species? This is an interesting question. It has been suggested that the delay is the result of natural selection, and is due to the fact that for one reason or another the human mother for long periods of time found it inconvenient or impracticable to nurse her child immediately after delivery. However this may be, it should not be forgotten that the secretion of milk is sometimes delayed much longer than is usually the case—perhaps until five or six days after delivery, as I have myself witnessed. The attendant should not be in too much haste to decide that permanent bottle feeding is necessary.

CHAPTER X

THE MANAGEMENT OF THE PUERPERIUM

With the expulsion of the placenta and membranes the third stage of labor is complete. The puerperium, or lying-in period, has begun. Strictly speaking, the puerperium occupies the period extending from the end of the third stage until involution is complete, from six to eight weeks. Unfortunately the physician usually loses track of his patient long before this. Hence the term is usually applied to the period for which the patient remains in bed and under the immediate care of her physician, two or three weeks, perhaps. It is far better, however, as we shall presently see, that the patient be kept under observation until involution is complete.

What can we do to secure for our patient a safe and uninterrupted convalescence?

Let us assume that the patient has been carefully watched for an hour, or better, two hours, after delivery; that the uterus is well contracted, and the pulse and general condition satisfactory.

Rest and Sleep.—Nothing does a recently delivered woman as much good as a few hours of rest and sleep. The room should be darkened, but an abundance of fresh air admitted. The patient may see her mother or husband for a short time, but anxious and inquisitive friends should be excluded. Matters of dress and appearance, the inspection of the baby, etc., should be postponed. She should refrain from much talking, or from voluntary muscular effort. I have known a strong and vigorous woman to bleed to the point of faintness from disobeying orders and sitting up in bed shortly after delivery. Of course, this does not happen often, but in the practice of the careful obstetrician it never happens, which is better.

If the patient is suffering from the effects of hemorrhage or from shock, or from extreme weakness, it is wise for her to remain perfectly quiet in the dorsal position and with the head low. If, however, there is no contra-indication, *i.e.*, if after the lapse of two hours the uterus is well contracted, and the pulse good, she may be allowed to turn upon the side. In this position she will be much more comfortable and can sleep better. As we shall see presently, there is no foundation for the popular idea that the patient must remain constantly in the dorsal position, a position which soon becomes a species of torture.

Meanwhile we should not forget that secondary hemorrhage, while rare, does sometimes occur. A watchful nurse should note at intervals the patient's general condition, the character of her pulse, the color of her face, and the degree of uterine contraction; and should satisfy herself

by actual inspection that there is no excessive bleeding—all this with as little disturbance as possible (Fig. 135).

If all this is accounted pedantic and unnecessary, so be it, but it is in this way that the patient recovers most quickly from the shock and fatigue of labor, and best avoids the danger of hemorrhage and embolism.

The Prevention of Infection.—What can be done to prevent infection? The danger is greatest during the first few days. At this time the vulva and vagina constitute a fresh wound which must be shielded from all septic

FIG. 135.—Watching the fundus after delivery.

contact. This is accomplished first, by scrupulous external cleanliness, and second, by the avoidance of all internal manipulations.

The vulvar dressing of sterile gauze, or sterile absorbent cotton, should be large enough not only to cover the vulva, but also to fill completely the space between the thighs, thus shutting out all possibility of septic contact. It should be held snugly in place by a T-bandage, also sterile, pinned to the binder if the latter be used.

Morning and evening, and whenever the dressing is changed after urination or defecation, the external parts are freely irrigated from before backward with lysol solution poured over the parts from a pitcher; or better, the stream from a fountain syringe is allowed to play over the

parts. For the first few days all handling and scrubbing should be strictly forbidden, as likely to reopen partly healed tears and to convey infection. This is especially important when the nurse is untrained and ignorant of aseptic technic, as is so often the case.

During the irrigation the patient lies on her back over the bedpan, and when the cleaning process is completed the pad is at once replaced. Some physicians and nurses are fond of inspecting the parts to see how the healing process is progressing, especially after perineorrhaphy. This practice should be emphatically condemned as tending to retard healing and to increase the risk of infection.

Only a slovenly and utterly incompetent nurse will replace a dressing that has once been removed for any cause whatever.

As we shall see directly the strict limitation of the use of the catheter and the avoidance of douches, and of all internal manipulations that are not strictly indicated, are important in this connection. If sponges are used they should be of sterile absorbent cotton, or sterile gauze, soaked in lysol solution, and the sponge only, not the fingers, should be permitted to touch the parts.

The Abdominal Binder.—From time immemorial it has been the custom to bandage the abdomen of the recently delivered woman. Of late this custom has been vigorously attacked and as warmly defended. It has been attacked on the ground that it may cause backward displacement of the uterus. I believe there is some truth in this assertion. Some writers insist that it tends to preserve the figure. This I believe to be a fiction, but it is one which is firmly believed by the laity. The idea that it prevents hemorrhage is of course fallacious. There is no doubt, however, that a binder applied after delivery is a source of great comfort to the patient. It supports the stretched and relaxed abdominal wall, and perhaps, by keeping up intra-abdominal tension, prevents cerebral anæmia. The latter may be of importance in cardiac cases. It also permits the patient to turn upon her side, without the troublesome sagging of the enlarged and heavy uterus, and it affords a firm support for the attachment of the vulvar dressing in front and behind.

I would sum up the matter in this way. I usually advise the use of a moderately firm bandage for the first few days. It is comforting to the patient, does no harm, and possibly may do some good. After this the patient may dispense with it or not, as she prefers, but if it is worn at all it should not be tight enough to make much pressure upon the uterus. In this way one secures whatever benefit there may be in its employment and avoids any ill effects. It may be well to remind the young practitioner that ignorant women and unskilled nurses are apt to attribute all sorts of trouble in later life, and especially an ungainly figure, to the omission of the binder. I agree with Whitridge Williams that as far as the preservation of the figure is concerned the bandage does most good at the end of the second week, when the patient first leaves her bed. By this time the

fundus can no longer be felt above the symphysis and a firm abdominal bandage can do no harm.

The bandage usually employed is of unbleached muslin, and extends from the trochanters to the false ribs. This suffices while the patient is in bed. When the fundus can no longer be felt above the symphysis,

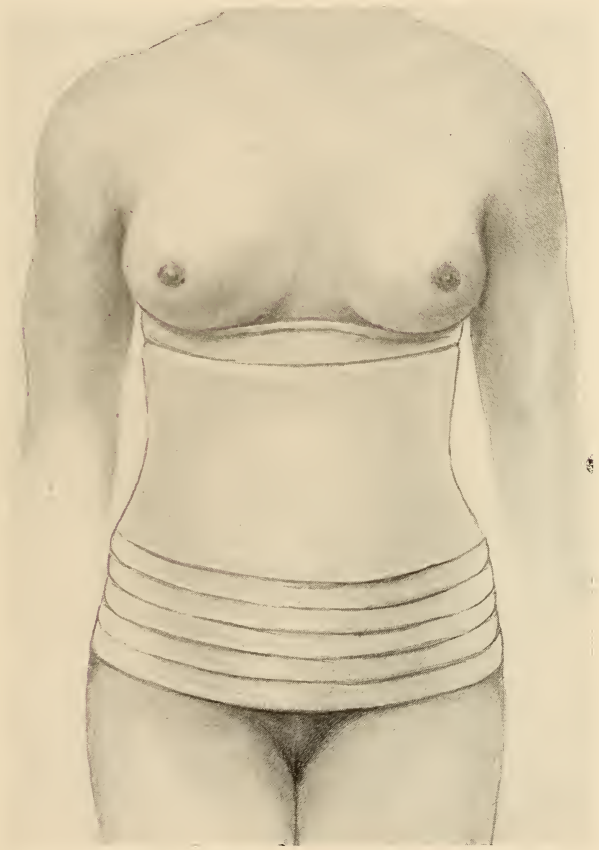

FIG. 136.—Elastic bandage 20 centimetres wide and 6 metres long.

an elastic bandage carried several times around the abdomen, or a snugly-fitting abdominal supporter, is to be preferred (Fig. 136).

After Pains.—After pains are the result of the effort of the uterus to expel a blood clot. They are not common after first labors, for the uterus of a primipara is usually firm and well contracted. The lax uterus of a multipara, however, often permits the collection and retention of large clots and the patient may have to go through a miniature labor to secure their expulsion. The best remedy is ergot; a drachm at once,

followed by one-half drachm every three or four hours, for a day or two. If the patient is very sensitive a little paregoric or codeine may be combined with the first dose or two of ergot.

Now and then one meets a case in which the after pains are exceptionally severe, quite as severe, indeed, as the pains of labor. I recall the case of a patient who had had several attacks of appendicitis but had refused operation. In this class of cases the pain is probably due to the dragging of the uterus upon old adhesions in the pelvic or abdominal cavity. Here nothing avails but large doses of narcotic medicine. Fortunately this class of after pains is not often encountered. Indeed, I am not sure that I have seen it described in print, though I have met with two or three examples.

Diet.—The toast and tea system is obsolete, and deservedly so. It is a relic of the time when too much depletion was in vogue. A recently delivered woman does not need depletion, but rather support. Her convalescence will be more rapid, her strength sooner recovered, she will have more and better milk for her baby, and she can better resist infection, should it occur, if she have a reasonable amount of good nourishing food. No special regimen is necessary. Recalling the first two or three days of constipation, and also the fact that patients in bed do not ordinarily require as much food as others, we will not urge her to eat simply for the sake of eating. Nevertheless, the appetite and desire of a healthy and sensible woman is here the best guide. Dyspeptics, however, and those who are given to gormandizing and who are fond of sweets and desserts, need restraint, or they may contract an attack of acute indigestion, attended by fever, and giving rise to much anxiety to the attendant and to the friends of the patient. But these cases are rare. In general, I am accustomed to say to my patients that until the bowels have moved upon the third day, they may have any semisolid and easily digested food that they prefer, *e.g.,* soups, cereals, weak tea or coffee, and that after that they may eat anything they like, excluding, of course, those articles which are notoriously indigestible, or which they know from experience disagree with them. I think that there is a tendency to give too much milk, thus causing indigestion and constipation. Doubtless this is due to the popular belief that "milk makes milk," and that the mother who drinks much milk will have much milk for her baby; but there is no evidence that this is the case. If the patient is in the habit of taking wine with her meals she may continue the practice, but if not, she should not begin the practice at this time. The idea that a healthy puerpera needs alcohol to strengthen her is a delusion. Our German confrères say that beer should not be used during the lying-in period, as it predisposes to hemorrhage, and their opinion must be accepted as authoritative.

A tradition handed down from barbarous times has it that women should not be allowed water at this time. This pernicious idea has done much harm and caused much unnecessary suffering. If the patient has

retention of urine, or if the breasts are painfully distended and the milk supply excessive, it may be wise to restrict the supply of liquid for a short time, but as a general rule, cool water should be allowed as the patient desires it. Coffee is said to diminish the supply of milk, and overindulgence in this luxury is not to be advised, especially when the milk supply is deficient.

Douches.—It was formerly the custom to give antiseptic douches before, during, and after labor, with the idea of destroying germs already present in the vagina. This custom has been very generally abandoned, and with good reason. In the first place, nature has amply provided against infection. The acid mucus of the vagina inhibits bacterial development, and after rupture of the membranes the cervicovaginal canal is flooded with liquor amnii, which some one has not inaptly compared to a normal salt solution, and, we might add, a sterile one, at that. Moreover, the fœtus during its emergence is closely embraced at all times by the retracting ostium vaginæ, so that neither air nor foreign body can enter.

To these theoretical considerations may be added the fact that it has been abundantly shown, both in hospital and private practice, that douches are not necessary. This has been my own personal experience in many hundreds of cases. To permit untrained nurses to give douches to a recently delivered woman, for any reason whatever, is to invite infection.

Attention to the Bladder.—The use of the catheter should be avoided if possible. It is a frequent source of cystitis, pyelitis, etc., and may initiate conditions that can never be completely remedied.

Some physicians leave their patient with the stereotyped advice to the nurse, "If the patient does not urinate within six or eight hours use the catheter." *This is a very serious mistake* and is often followed by deplorable consequences.

With proper precautions catheterism is safe enough during pregnancy and labor, probably because there are no wounds to infect. After delivery, however, the conditions are quite different. The various factors that predispose to infection are operative in the urethra as well as in the vagina. The urethral mucous membrane has been bruised and lacerated by the enormous pressure to which it has been subjected, its resisting power is diminished, and the meatus is the seat of multiple abrasions and minute lacerations. The vulvovaginal secretions abound in bacteria, including the omnipresent colon bacillus, which Alsberg has recently shown to be present in the urethra, and lochial decomposition soon begins.

Under these circumstances it is not strange that catheterism, even when performed with the utmost care, often results in disaster.

If the patient can once be made to urinate by voluntary effort, the subsequent use of the catheter will not be necessary, whereas, if the catheter has once been passed, it may be necessary to continue its use for days. This means much added manipulations of the parts, and vastly increases the danger of infection of the birth canal, as well as of the urinary tract.

Abundant observation has convinced me that a delay of from twelve to eighteen hours does no harm in these cases. Doubtless there are factors, perhaps not well understood, which make retention of urine less harmful at this time than at others, and I believe that it is better to wait until there is positive evidence of distention before interfering.

Various artifices are known to the experienced nurse. Some of them, *e.g.,* the sound of running water, work by suggestion. Hot cloths to the abdomen and hot sterile cloths to the vulva may be useful. Very effectual is the administration of a large hot enema. Reynolds has made the ingenious suggestion that, during the latter weeks of pregnancy, the patient accustom herself to urinating in the recumbent position.

If the patient is in good condition, the pulse slow, and the uterus well contracted, and if there is no special contra-indication, it is probably better for her to be assisted to a sitting position than to use the catheter. Some patients are able to urinate upon their hands and knees.

In the rare cases in which catheterism is unavoidable, it should be performed with every aseptic precaution. This task should be entrusted only to a nurse in whom the attendant has entire confidence, and it should not be repeated unless necessary. The meatus should be freely exposed and the adjacent tissues freed from mucus, etc., by irrigation. Tissues about the meatus are then cleansed with lysol or bichloride solution, and the catheter passed directly into the meatus under the guidance of the eye.

Attention to the Bowels.—The traditional dose of castor oil on the third day is undoubtedly a good thing for dyspeptics and plethoric subjects, but is not always a necessity. With many patients a dose of the milder and usually more acceptable effervescent citrate of magnesia or some natural mineral water is sufficient. If the bowels have been well opened before labor an enema is often all that is needed. The latter has the advantage of not disturbing the baby. In obstetrics, as elsewhere, one should be guided by common sense rather than by arbitrary rules. On the whole, catharsis after delivery is usually overdone, especially in hospitals. Nothing is more stupid than to give a delicate and anæmic woman, who has perhaps had a severe hemorrhage, an enormous dose of castor oil simply as a matter of routine, and yet, who has not seen this done? On the other hand, an ounce of castor oil, or, if the patient cannot take this, a teaspoonful of compound licorice powder, may, in the case of a plethoric patient of full habit, or one habitually constipated, be exactly what is needed. After the first two or three days the bowels should move at least every other day, as long as the patient remains in bed. As a rule, if there is a tendency to slight headache, bad taste in the mouth, a coated tongue or accumulation of gas in the bowel, or if the patient suffers from habitual constipation, laxatives are to be preferred, otherwise enemata. Saline cathartics are, as a rule, to be avoided since they tend to weaken the patient and to diminish the supply of milk. If, however, there is overdistention, or threatened abscess of the breasts, or if it is desired to "dry up" the milk, watery

movements are desirable, and salines are indicated. As explained elsewhere it is better that the bowels be not moved too early after extensive perineorrhaphies, and especially after the repair of tears of the third degree. If an enema is to be given shortly after delivery, or when an extensive perineorrhaphy has been performed, it should be given only by a skilled nurse, or by the physician himself. Otherwise, the danger of infection in the first case, or of disturbance of the stitches in the second, is too great.

Temperature and Pulse.—The temperature and pulse should be taken at 8 A.M. and 5 P.M., and at other times whenever it may seem desirable. Under ordinary circumstances, however, it is neither necessary nor desirable to disturb a nervous or sensitive patient every few hours for this purpose, as is sometimes advised.

Visits of the Physician.—The physician should see his patient every day for the first week and every other day during the second week. More frequent visits than this are not usually necessary provided the nurse is thoroughly reliable and the case is proceeding normally. At these visits he should inquire as to the pulse, temperature, and excretory functions of the patient, and should note her demeanor and general condition. He should look most carefully after the breasts and nipples, and satisfy himself as to their condition by actual inspection. This is a most important matter for both mother and child, and we might add, for the physician himself.

At these visits he should particularly avoid inspecting the vulva or perineum, or making local examinations, unless these procedures are distinctly indicated, and they seldom are. If not indicated, they do no good, and serve only to annoy the patient, to interfere with the healing of wounds, and to increase the danger of infection. Some men who rigidly exclude visitors forget that they themselves may do harm by their unnecessary solicitude.

He should satisfy himself, if necessary, by actual inspection, as to quantity and character of the lochia, and especially whether it is excessive in amount, or of offensive odor. The first condition might indicate the use of ergot, together with an ice-bag over the uterus, and the latter a more careful aseptic toilet of the vulva, or perhaps antiseptic vaginal irrigation.

He should palpate the fundus every two or three days, note whether it is gradually and regularly descending, and be prompt to recognize and treat any tendency to subinvolution. Too much manipulation should be avoided, however, as it does no good and is often quite painful.

The attendant should not forget to note the general condition of his patient and to remember that intercurrent affections, though rare at this time, do sometimes occur. For this reason he will not fail to investigate occasionally the heart, lungs, throat, etc.

I recall the case of a febrile puerpera who was subjected to a searching examination, which included aspiration of the breast, before it was discovered that the symptoms were due to an abscess at the root of a tooth.

In a word, the careful and judicious physician will endeavor at each visit to find out all about his patient, with very little disturbance or manipulation; and this he can usually accomplish.

At these visits *the baby should not be neglected.* The physician should never take the assurance of an untrained or untrustworthy nurse as to the

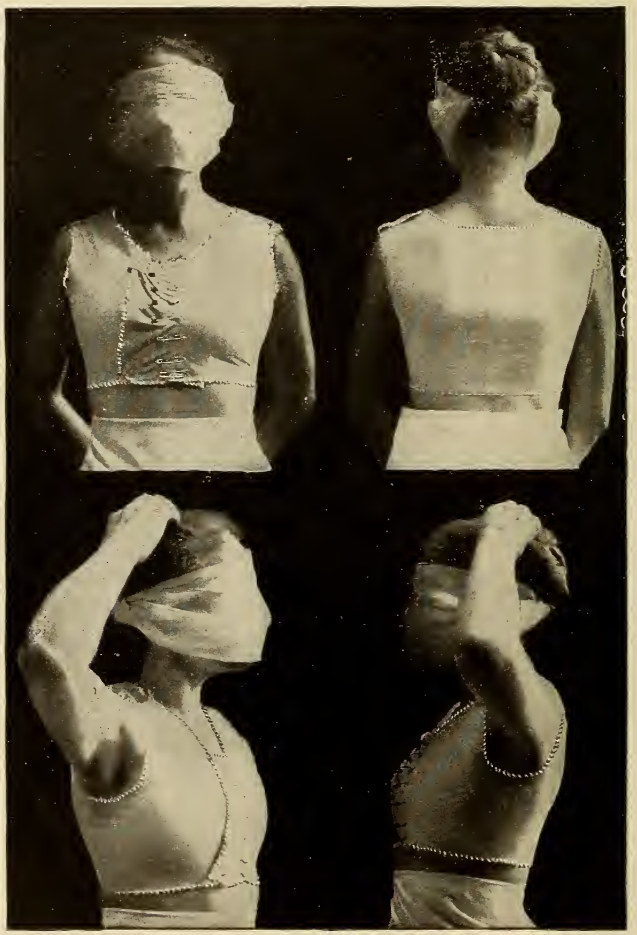

FIG. 137.—Dr. Cooke's breast binder.

condition of the child. Especially should he satisfy himself, by actual inspection, that the child sucks milk from the breasts and swallows it, and by personal investigation, that it is gaining in weight. I have often found that the child simply held the nipple in its mouth, getting little or no milk. In cases of doubt he should, if possible, secure the services of a skilled pediatrist in consultation.

He should never neglect to examine the child for congenital defects, to be on his guard against umbilical infection, and to look carefully after the child's eyes. All these things take little time, and their neglect may be the occasion of bitter regret. Parents, not especially exacting about other things, are slow to forgive any neglect, or supposed neglect, of a child.

Breasts and Nipples.—In spite of the protests of officious bystanders the baby should not be applied to the breasts until the mother has had a period of rest. A mature and healthy child needs no food during the first twelve to eighteen hours. *The mother needs rest.*

The breast bandage, like the abdominal bandage, is a matter of custom and convenience rather than of necessity. If the breasts are large and sag heavily, a supporting bandage may afford relief and at the same time help

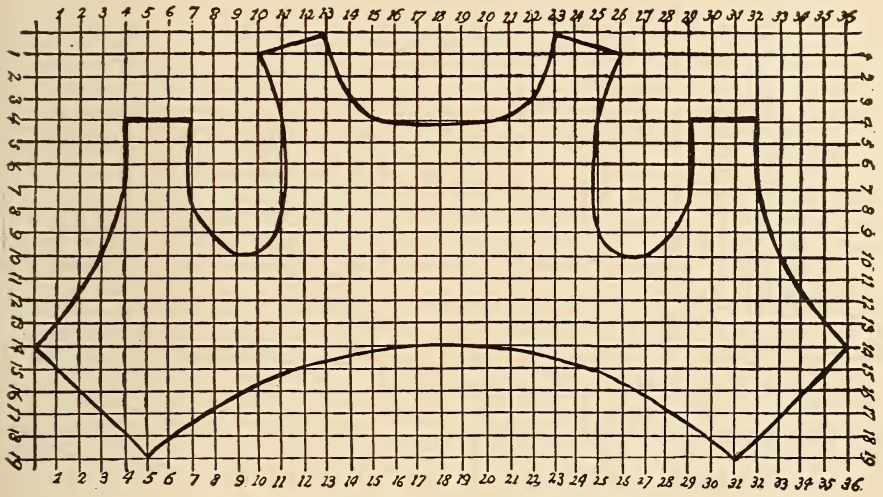

FIG. 138.—Pattern of Dr. Cooke's breast binder.

to keep in place the sterile dressings over the nipples. Some patients are annoyed by the bandage, especially in hot weather, and in such cases it may be dispensed with. If a breast bandage is used, that of Dr. J. B. Cooke is perhaps as good as any (Figs. 137 and 138).

About the third or fourth day after labor, when the milk first appears in the breasts, the latter may be much distended and quite tender, especially in the neighborhood of the axillæ. If the child cannot take enough milk to relieve the condition, it is well for the nurse to remove the milk by gentle massage after each nursing. In this way the mother is not disturbed at irregular hours. In place of massage the breast pump may be employed, but the former is to be preferred if effective and not extremely painful, since it involves less handling of the nipples and therefore less danger of infection.

After nursing the nipple should be carefully cleansed with a saturated solution of boracic acid, dried with sterile absorbent cotton, and kept dry as far as possible until the next nursing. Ointments and salves should be forbidden since they tend to cause maceration of the nipple, and are seldom or never sterile. The patient should not be allowed to touch her nipples, and the nurse in washing them should hold the sterile swab soaked in the boracic acid solution in such a way as to avoid contact of her fingers with the nipple.

Some advise that the child's mouth be washed before and after each nursing. This, I believe, is carrying preventive treatment too far. The tender mucous membrane of the child's mouth is easily injured by so much handling, and infection is more likely to be caused than prevented, especially in hospital practice. In the intervals between nursing the nipples should be kept covered with sterile gauze so arranged as to prevent any direct pressure.

Bathing.—The traditions of the lying-in chamber have made this a highly important ceremony but as a matter of fact there is no haste about it. Indeed, as often practised it does more harm than good. If the eyes are clean and the umbilical dressing has been made *lege artis,* a delay of two or three hours does no harm and is probably better for all concerned. The tub bath at this time should be unreservedly condemned as a source of cord infection and unnecessary exposure. Jacobi long ago made us mindful of the danger of exposure and it is self-evident that to bathe the umbilical wound in water which, even though sterile at the start, cannot long remain so, is to invite infection.

Any excess of vernix caseosa is best removed, not by soap and water, but by sterile albolene or sweet oil. In full-term children or those a few days beyond term, there is but little vernix, and its removal is quickly and easily accomplished. In the case of premature children the vernix is abundant and quite adherent, and if there is much trouble or delay in its complete removal it is far better to wait than to spend too much time in attempting its complete removal. Great care should be taken not to contaminate the umbilical wound or the dressing if this has been applied. If a competent nurse is in attendance it will have been wrapped in a sterile towel and the dressing of the cord as described above entrusted to her. If not, it is necessary that the doctor make it himself before opportunity for contamination has been given.

The proper care of the breasts and nipples, with special reference to the prophylaxis of erosions and fissures, and thus, indirectly, of abscess of the breast, is one of the most important duties of the accoucheur. Abscess of the breast is a painful and disastrous termination of the puerperium. Not only does it result in the suspension of nursing with perhaps serious or even fatal consequences to the child, but it may destroy the functional activity of the breast, and prevent the nursing of future

children. In the breast as elsewhere infection is more easily prevented than cured. What measures are to be employed?

In the first place let us recall that erosions of the nipple are the result of the traumatism involved in nursing. A predisposing cause is maceration of the nipple epithelium, the result of too frequent or too prolonged nursing. It is obvious, then, that the nipple should be kept as clean and dry as possible, and that the direct application of the child's mouth to the nipple should be restricted.

The French seek to avoid maceration of the epithelium by allowing the child to nurse but once in three hours. My experience has led me to believe that many children cannot obtain sufficient nourishment in this way, and I prefer (after the establishment of the milk secretion), to adhere to the two or two and one-half hour interval, giving both mother and child a rest between midnight and morning. The breasts should be nursed in alternation, and the child should not be allowed to play with the nipple, or hold it in the mouth after nursing.

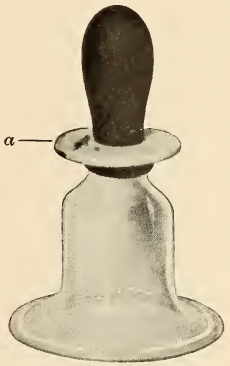

FIG. 139.—Nipple shield. Best kind.

In sensitive patients, the first efforts at nursing produce some smarting and discomfort, which, if only moderate and affecting both nipples alike, is of no special significance. When, however, the suffering is severe, or the patient complains that one nipple is more sensitive than the other, erosions, perhaps so slight that they can hardly be seen by the naked eye, are usually found.

In these cases I am accustomed to advise the use of the glass and rubber nipple shield, thus removing the cause of the trouble at once. The shield should be kept clean, and when not in use should be immersed in a saturated solution of boracic acid. It can usually be dispensed with in a few days (Fig. 139).

To insure success in its use, perseverance and attention to detail are needed. Some nurses object to the use of the shield because it involves too much trouble, or because they have failed at the first trial, or from a foolish idea that it is not good for the baby. It is far better for the latter to be obliged to use the shield for a few days than to be obliged to give up nursing altogether.

In some cases the rubber nipple is too long and projects into the throat, irritating and choking the child and thus preventing satisfactory nursing. This can be remedied by pushing the ivory ring (*a*) nearer the point of the nipple. Sometimes the child may be induced to suck by expressing a few drops of milk from the breast into the rubber nipple. The mother should be turned over almost on her face so that the nipple points downward, thus making suction easier. Attention to these seemingly trivial, but really important, details is well worth while.

The Care of the New-Born

Few obstetricians are good pediatrists. It is folly to try to teach pediatrics in a work on obstetrics. The field is too large and the responsibility involved too great. Nevertheless there are certain precautions that should be taken in every case and certain common mistakes to be avoided. These it may be well to consider here.

The care of the eyes and the ligation and first dressing of the cord I have already considered in connection with the management of labor, to which, as I believe, they belong. After these have been attended to the child should be made warm and comfortable and laid upon its right side in some place where it will be secure from harm and its eyes shielded from the light. Here it should remain until the mother has received such immediate attention as is necessary. It is well for the nurse to inspect the umbilical dressing occasionally in order to see that it is not bleeding and to make sure that the child's coverings are so arranged about the face that air is not excluded. Children that have been born more or less asphyxiated and have been resuscitated with difficulty should be watched closely and any change reported at once. Indeed, it is better that the attendant should not leave such cases too hastily. More than this is not necessary. The best thing for the baby at this time is that it be let entirely alone. It is too often the case that in the excitement attending the arrival of the long-awaited baby the mother is temporarily forgotten and hemorrhage perhaps overlooked or aseptic precautions neglected. This is especially apt to be so when the case is not in the hands of a competent nurse.

Clothing.—This is usually the province of the nurse, and will vary with the means and tastes of the parents. Only a few hints are necessary here. Clothing should be loose and warm. No tight bandages! No constriction about the chest. The band about the abdomen should be tight enough to keep the umbilical dressing in place and no tighter. Garments next to the skin should be of linen or cotton mesh or some similar material. These are much more hygienic and cleanly than flannel, absorb moisture, and permit the conduction of heat and the free ventilation of the skin. Let the doubter experiment with flannel as a diaper or a pocket handkerchief and he will be convinced. Of course, the new-born child should be kept warm, but an excess of wrappings in hot weather is to say the least a useless barbarity. Here as elsewhere it is hardly too much to say that the young mother if left to herself will do better to follow the instincts of her own common sense than the advice of those about her, of ignorant bystanders and untrained nurses. For the details of dress and nursery management the reader is referred to Cooke's "A Nurse's Handbook of Obstetrics" (last edition, revised by Miss Gray and Miss Baker).

Feeding.—This is by all odds the most important part of the child's management, and it is a mistake, I think, to undertake its extended discussion in an obstetric text-book. Knowledge thus gained is of necessity

imperfect and study of this kind tends to superficial and "short cut" methods of investigation. I shall therefore restrict myself to a few words on the subject of breast feeding.

Every new-born baby makes involuntary and automatic movements of suction, especially when something is placed in its mouth or brought near its lips. These movements are interpreted by the bystanders as meaning that the child is hungry and lead to a demand that it be immediately fed. As a matter of fact, however, a healthy full-term child needs no food at this time and to put it to the breast only serves to deprive the mother of her well-earned rest.

Every mother should nurse her child unless there is some good reason why she should not do so. If she cannot nurse her child the ideal substitute is wet nursing, but there are so many difficulties in the way of securing a wet nurse that mixed or bottle feeding is usually the final outcome. If a wet nurse is decided upon the physician should be careful as to the following points: The child of the wet nurse should be of approximately the same age as that of the child to be nursed. The wet nurse should not be pregnant, and should be in good health, as proven by painstaking examination. In particular, should she be free from tuberculosis and syphilis. The Wassermann reaction should on no account be omitted, the milk as well as the blood serum being examined.

The child may be put to the breast after eight or ten hours, and after that every four hours for two or three days, or until the milk secretion becomes established. One interval at night may be extended to six or even eight hours in order to give the mother a good period of restful sleep.

The Caput Succedaneum.—I have already referred to the moulding of the fetal head, a phenomenon with which every practitioner soon becomes familiar. Whenever moulding is marked we find at the apex of the moulded segment a soft œdematous scalp tumor, the caput succedaneum. This represents the most accessible portion of the presenting part, or in other words, the portion which is free from pressure. This portion swells and becomes the seat of hyperæmia and serous effusion.

The tumor thus formed is known as the caput succedaneum (*Kopfgeschwulst*). It is most marked in cases of delayed labor and especially of dry labor in which the head is subjected to pressure from the beginning. It may even occur in cases of delay due to a small and rigid vaginal outlet. It does not occur before rupture of the membranes and of course it is not found in cases of breech delivery and after the Cæsarean section. It is important as an indication of delayed labor and sometimes, though by no means always, as an indication for operative delivery. A long caput may extend far in advance of the head. It may, however, deceive the unwary. Now and then one finds what appears to be the occiput protruding at the vulva and anticipates delivery within a short time, or at least an easy forceps operation. Careful examination, however, or if

this is neglected, an attempt with the forceps, shows that the head is higher and the case more difficult than was supposed.

Then, too, the location of the caput as observed after delivery enables one to confirm or correct his diagnosis of the position of the head. For example, if the occiput is in the left anterior position the caput will be on the right parietal bone, and *vice versa*. Similarly, if the occiput is posterior the caput will be farther forward, *i.e.,* in the neighborhood of the large fontanelle.

Cephalhæmatoma.—When the conditions that ordinarily produced the caput succedaneum are exaggerated there may be a rupture of the blood-vessels between the periosteum and the bone with a resulting hæmatoma. Since the effusion of blood is beneath the periosteum, the tumor cannot, like that of the caput succedaneum, extend beyond the border of the bone upon which it originates. In other words, it cannot cross a suture. Even when there are two hæmatomata, as sometimes happens, each is confined to the bone upon which it originates, and a line of demarcation may be easily made out.

Posture in Bed.—Although I usually advise my patients to remain in bed for two weeks or more, I believe that it is well to allow them considerable latitude in the way of position and movement. The ten days' dorsal decubitus is a thing of the past. In normal cases with a good pulse and a well-contracted uterus there is, after the first few hours, no good reason, no good excuse even, for keeping the patient constantly upon her back. At this time she can be turned gently upon her side, where she will rest much more comfortably and sleep better. Cases of shock or hemorrhage, of course, constitute an exception to this rule.

There are several good objections to the continued dorsal position. The large and heavy uterus sags backward, and it is not unreasonable to suppose that subsequent retroversion is thus favored. Then, too, the long-continued dorsal position interferes with drainage. Drainage from the vagina is favored by the lateral position. This is easily demonstrated. If a patient receives a vaginal douche in the dorsal position the solution is retained, but if she turns upon her side, the solution runs freely from the vagina.

Sudden movements, or those that require much muscular effort, should be prohibited on account of the danger of hemorrhage, or the possibility of embolism.

Toward the end of the first week the patient may sit up in bed for her meals, and later she should be advised to assume occasionally the prone or semiprone position, thus favoring the normal anteversion of the uterus. At the beginning of the third week, if the fundus is no longer felt above the symphysis she may be assisted from her bed to an easy chair, where she may rest for an hour or two. The period of sitting up may be increased by an hour each day, and by the end of the week the patient may be allowed the freedom of her room and bath. After this she may be left to her own

devices, being cautioned to take a nap of an hour or two every day, and being told that a backache or a "bearing down" feeling is a signal for her to lie down, and, if it does not disappear, to send for her physician.

Of course all our patients cannot, and some will not, follow this regimen. Doubtless there are many cases in which it is not necessary, but it can do no harm, and in the great majority of cases it does much good.

When May the Patient Leave Her Bed.—Every teacher of obstetrics frequently hears the question, "How long should the patient remain in bed after delivery?" What I have said above seems to me to be a fair answer to this question. I am accustomed to add, however, that in any case she should not leave her bed until the uterus has descended so far into the cavity of the pelvis that the fundus can no longer be felt above the symphysis. This varies in different cases. This rule, which was that of the late Dr. Garrigues, is to my mind an excellent one, and deserves more attention than it has apparently received. After long and tedious labors and difficult operative deliveries the period of confinement to bed should of course be extended according to the judgment of the physician.

Some enthusiasts have recently advocated getting the patient up on the second or third day after delivery. This proposal has been summarily and deservedly rejected by the common sense of the profession. It is based, of course, upon the idea that labor is a purely normal, physiological process. As we have already seen this is theoretically, rather than practically, true. Post-graduate students at the New York Polyclinic have often told me that among the Indian women who practise this method, displacement and prolapse are exceedingly common, and death by no means as rare as is usually supposed.

Like other wounds, the wounds that result from labor heal more promptly when the patient is at rest. The exact nature of these wounds we do not always know. That they are reopened by too early getting up is plainly shown by the appearance of the lochia rubra on the tenth day. This reopening of puerperal wounds may result in a severe infection, especially, as we shall see later, in gonorrhœal cases. If nothing worse happens, the patient will certainly lose more blood by leaving her bed too early. Aichel has reported a number of fatal results. I have seen one myself—a case of embolism. The patient was permitted to go out on the eighth day, and was brought home dead a few minutes later.

When one recalls the undoubted fact that moderate degrees of phlebitis are quite common, and that there is an aseptic thrombosis of the pelvic veins that presents no symptoms whatever except, in some cases, a persistently rapid pulse, the danger at once becomes apparent.

In many families it is customary to dismiss the nurse as soon as the patient is able to leave her bed. This is poor economy. A good nurse during the third, and, if possible, during the fourth, week is not only a luxury but a great benefit to the patient. The latter usually looks forward eagerly to leaving her bed, thinking that her troubles will then be over.

As a matter of fact, it is only too often the case that her real troubles begin at that time. She has not as yet fully regained her strength. She has not only the physical burden of nursing her child, but the new and trying responsibility of its general care. She is perhaps harassed by household duties and worn out by loss of sleep. The result of all this may be a mental and physical depression that leaves its traces years after.

Final Examination.—It was formerly customary for the physician to dismiss his patient as soon as she was able to leave her bed, usually from ten days to two or three weeks after her delivery, perhaps not to see her again. It is now recognized that the man who adopts this course neglects the interests of his patient.

Before leaving his patient or allowing her to be permanently upon her feet the attendant should on no account omit to make a final examination for the purpose of determining to what extent, if any, she has been injured by the parturient process.

The task is easy. As we have already seen, the abdominal and pelvic tissues are at this time very lax, the enlarged and easily palpable uterus freely movable, the appendages easily mapped out. The thinned and atrophied abdominal wall makes all the abdominal viscera easily palpable, and small tumors, *e.g.,* fibroids, previously unsuspected, are made out with the greatest facility. The dilated and relaxed vagina permits the easy introduction of the speculum, and the inspection of the cervix and vaginal canal.

Moreover, interest as well as duty dictates that this examination be made. For example, it is much better that the attendant himself discover a beginning prolapse of the uterus, or a bad tear of the cervix, than that the patient's attention should be called to some such disability by another.

The first thing is to determine the position of the uterus. The examiner should recall that at this time its normal position is one of marked anteflexion. Indeed, it is usually possible to feel the enlarged corpus uteri in the anterior *cul de sac* before it is depressed by the external hand.

Backward displacement of the uterus should be treated by reduction, and the employment of a retroversion pessary. In this way the danger of permanent displacement, or even of prolapse, may often be averted. In some cases the condition is the continuation of a backward displacement existing before pregnancy. This condition is not likely to be cured at this time, but is usually amenable to gynæcological treatment later.

The condition of cervix and perineum may be determined by inspection and touch.

Diastasis of the recti muscles is easily recognized, as are also movable kidney, and injuries to the coccyx, sacro-iliac joints and pubic symphysis.

As Hirst has recently emphasized, all these conditions are amenable to treatment and should be treated. If the attendant feels that he has not the requisite experience or facilities, he should secure such surgical or other aid as may be necessary. In this way he not only protects the interests

of the patient, but his own as well. *It cannot be too strongly stated, however, that the attendant is not necessarily responsible for everything that happens to a patient, during, or after, delivery.* There are some patients whose tissues are so friable that they will tear even when the disproportion is moderate and the operator's technic perfect. Now and then subinvolution, displacement, cystocele or prolapse will occur, even though tears, if present, have been properly repaired, the patient not allowed to leave her bed too soon, and the management of the case has been in every respect beyond reproach. In these cases the trouble is probably due, as Williams suggests, to distention by the presenting part rather than to demonstrable preventable causes. This fact is of the greatest importance from a medicolegal point of view. It is unfortunately true that bad obstetrics is responsible for much subsequent disability, but it is also true that now and then some malicious gossip, or envious colleague, attributes to the obstetrician an unhappy result for which he is in no way to blame.

CHAPTER XI

MULTIPLE PREGNANCY AND LABOR

Definition.—When a single act of intercourse results in the production of two or more embryos, the resulting pregnancy is known as multiple. In practice, multiple pregnancy usually means twin pregnancy, since the birth of triplets is a rare phenomenon, witnessed by few, even among those largely engaged in obstetrical practice.

Frequency.—Twin pregnancy is not so very rare, occurring, according to reliable statistics, in about one per cent. of all cases. Every physician meets, now and then, with a case of twin pregnancy, but there are many men largely engaged in obstetrical practice who have never seen the birth of triplets, an event which occurs about once in seven thousand cases. Many think of the delivery of quadruplets and quintuplets as belonging to the realm of fable, but such cases have been authoritatively reported, and quadruplets have been known to survive. Vassali even records the delivery of six embryos in the fourth month of pregnancy. According to Veit triplets are encountered once in 7910 labors, and quadruplets once in 371,125.

Etiology.—Heredity is the only agent of which we have positive knowledge. It is undoubtedly true that a tendency to multiple pregnancy runs in families. This is a matter of common experience. The tendency is usually transmitted by the mother, but occasionally by the father, a fact more difficult to explain. Instances of extraordinary fecundity have been those in which both father and mother have been members of twin-bearing families, as in the case of Boer, in which the father was a triplet and the mother a quadruplet.

Bumm, observing the frequency with which multiple pregnancy is associated with certain developmental anomalies, *e.g.,* bicornate uterus, polymastia, etc., suggests that it is a form of atavism, a suggestion that seems reasonable. According to Duncan, multiparity is a factor, multiple pregnancy being less common in primiparæ. The statistical researches of Williams have led him to believe that it occurs more frequently in cold climates, but this is doubtful.

Development.—Twins may be either, *bi-oval,* the result of the fertilization of two separate ova, one from each ovary, or two from one ovary, or, *uni-oval,* the result of the fertilization of one ovum by two spermatozoa. *Bi-oval* twins are found in 85 per cent. of all cases, *uni-oval* in 15 per cent.

In the case of bi-oval twins, the two ova usually come from separate follicles. Much more rarely, both ova are contained in one follicle. In the case of a patient who died from hemorrhage following twin labor, Bumm found many follicles containing two ova, and numerous follicles containing three.

Each bi-oval twin has its own separate and distinct placenta and sac of membranes. Sometimes, indeed, the two placentæ are so close to each other that they appear like one great placenta, but careful search will always disclose the line of separation. Similarly, the membranes may be

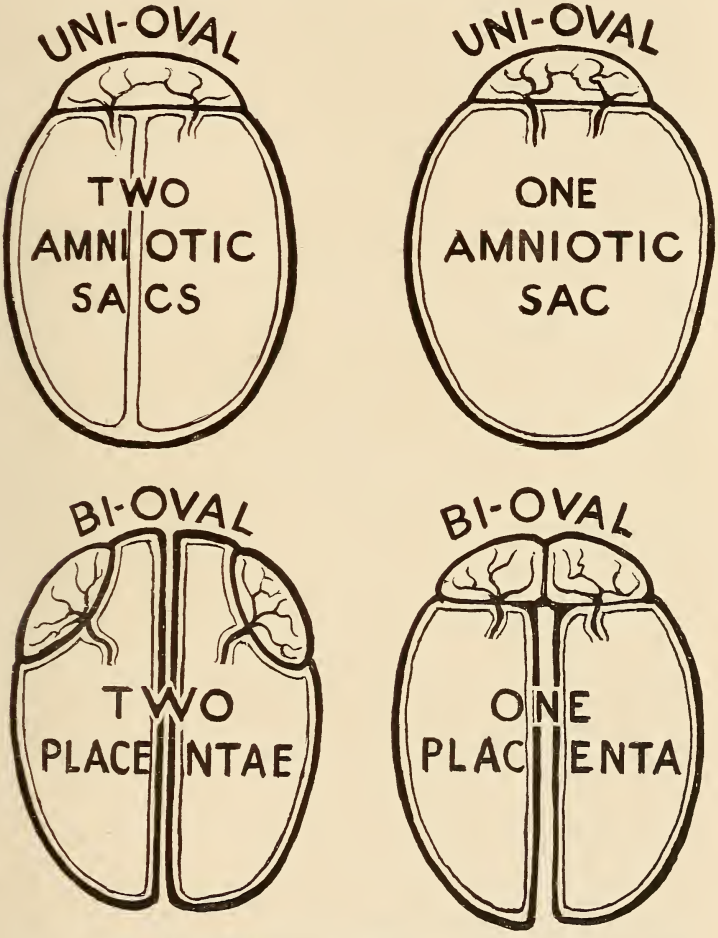

FIG. 140.—Schematic representation of different varieties of multiple pregnancy.

in such close contact in the median line that on superficial inspection they appear as one, but with care four layers, one amnion and one chorion for each, may be demonstrated (Fig. 140).

There has been much difference of opinion among embryologists as to the development of uni-oval twins. The discussion of this matter falls outside the scope of this work. Full details will be found in text-books on embryology.

What concerns us more here is that uni-oval twins have one large placenta. The two original placentæ coalesce to form one organ, homologous in structure and function. Each twin, however, usually has its

FIG. 141.—Twins with communicating circulations.

own amnion, and of course its own separate amniotic sac. Exceptionally there is but one amniotic sac for both.

Although uni-oval twins have but one placenta, each twin has its own separate circulation, the two circulatory systems being connected by an arterial and venous anastomosis. In some cases, however, one twin trespasses upon the circulation of its fellow. Thus, if one heart is stronger

than the other, it may happen that it overpowers the other and becomes the head of the entire circulatory system of both twins. The heart of the other twin then becomes atrophied from disuse, and with this goes an atrophy of the whole body. The result is a monster, the so-called acardiacus. If the child dies it may be compressed by its fellow to the thickness of parchment (fœtus papyraceus) (Figs. 141 and 142).

Twins often differ very much in size, and, apparently, in period of development. This has sometimes been regarded as an evidence of superfetation, but is probably due to differences in placental location, the placenta of one twin having a more favorable site for attachment.

Diagnosis.—The diagnosis of twin pregnancy is not always easy. Sometimes it is impossible.

Unusual distention of the abdomen is ordinarily the first thing that excites suspicion, though this, of course, may be due to other causes, *e.g.*, hydramnion, tumor, or unusual size of the fœtus. Now and then a furrow,

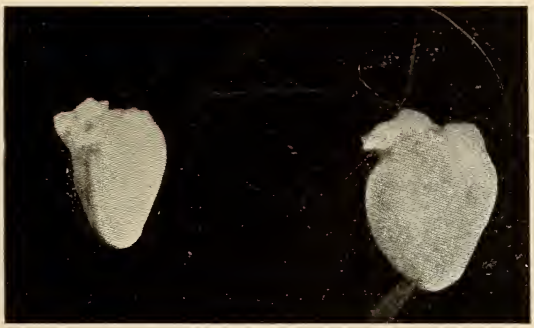

FIG. 142.—Hearts of twins shown in Fig. 141, natural size.

like that seen in cases of bicornate uterus, may be observed at the fundus. Great height of the fundus, as shown by the tape measure, is of considerable importance. It may be over 40 cm. at term. Fabre observed a case in which it was 48 cm. There is also a corresponding increase in width (Fig. 143).

Pinard has emphasized the fact that there is a continuous tension or pressure resistance in these cases that is very characteristic. On the whole, however, external palpation is much less satisfactory than in single pregnancy. Twins are usually premature, and much below the average in size, the heads are small, soft, and movable, and the other fetal parts correspondingly small. Hydramnion is a constant complication, and helps to obscure the diagnosis. If four fetal poles, two heads and two breeches, or three fetal poles, two heads and one breech, can be made out, the diagnosis is of course positive. But this, for the reasons just given, is theoretical rather than practical.

Sometimes ballottement performed in the usual manner may serve to

determine the position of one fœtus. If now another head can be found, either in one iliac fossa or at the fundus, the diagnosis becomes positive. Personally I have found this method of considerable value. A seeming multiplicity of small parts is a suggestive, but not very reliable, sign.

On the whole, the most satisfactory sign of twin pregnancy consists in the recognition of two fetal hearts, at some distance from each other, and beating at different rates. Since the heart-rate varies at different times, two men should count simultaneously, and since slight errors in counting are unavoidable, the difference should be considerable—ten or fifteen beats.

If the abdominal enlargement is great, and the fœtus cannot be outlined, the case is probably either one of multiple pregnancy, hydramnion, or very

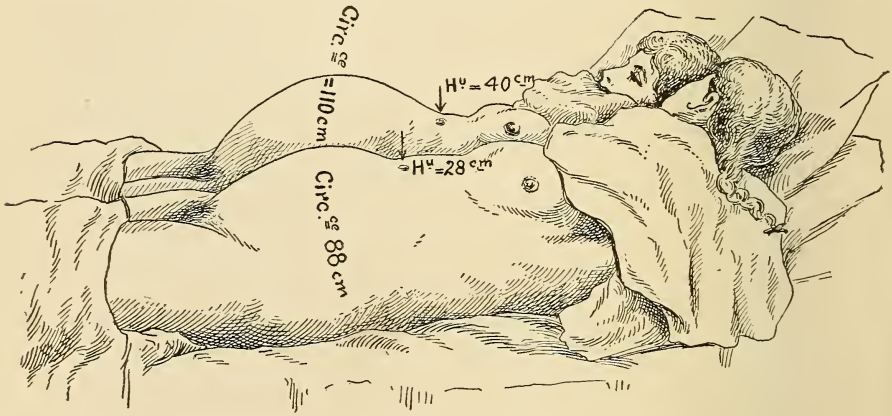

Fig. 143.—Height of fundus and circumference at the umbilicus notably increased in twin pregnancy.

thick abdominal wall. The latter of course is easily made out. If it is due to pelvic contraction or unusual size of the fœtus, external palpation will at once settle the matter. If, in a doubtful case, one large and firm head can be made out, multiple pregnancy may be excluded, since the heads of twins are small and soft. *This is a negative sign of decided value.*

Doubtless the X-ray, disclosing two fetal skeletons, will soon give us a reliable means of diagnosis.

A record of multiple pregnancy on either the paternal or maternal side increases the probability of its existence. But such evidence is of course not positive.

From all this it is plain that one should be guarded in making the diagnosis of twin pregnancy, though it is often easy to show that it does not exist. Fortunately an early diagnosis is of no great importance. In the majority of cases, the presence of the second twin is not suspected until after the delivery of the first. Even then it is not always suspected, and it has happened many times that the attendant has waited a long time

for the placenta, only to find that the delay was caused by the presence of another twin *in utero,* or if the birth of the first twin was followed by the expulsion of its placenta, has gone away unaware of the presence of a second child. A word of warning will suffice to put the reader on his guard against this ludicrous mistake, which of course could only be the result of carelessness. Two amniotic sacs, or a variety of fetal parts that could not possibly belong to one fœtus, may sometimes be felt upon vaginal examination, but this pertains to the diagnosis of multiple labor, not of multiple pregnancy.

The presence of triplets, etc., is not diagnosed until after delivery.

Clinical History of Multiple Pregnancy.—It goes without saying that multiple pregnancy imposes upon the mother greater burdens than does single pregnancy. The maternal organism must furnish more nutriment and oxygen, and there is an enormous amount of nitrogenous material to be eliminated. Hence the greater frequency of toxæmia and eclampsia.

The mechanical disturbances of respiration and circulation may become quite serious. Dyspnœa may be severe, and cardiac disturbances, if present, very much aggravated. Varicose veins of the vagina and vulva may reach enormous proportions. Fetal movements are multiplied, and may become a source of constant annoyance and loss of sleep. Owing to the great distention painful contractions are reflexly excited, and may continue for days or even weeks before labor begins. Indeed, in these cases it is often difficult or impossible to tell when pregnancy ends and labor begins.

During the latter weeks of pregnancy the canal of the cervix may be practically obliterated, and upon vaginal examination the cervix feels like that of the first stage of labor. Premature labor is the rule. Twin-bearing patients seldom go to term. Hydramnion is so common as to constitute a diagnostic feature.

Clinical Course of Labor.—The first stage is usually prolonged. The contractions are painful but ineffectual. This is generally attributed to paralysis of the uterine muscle from overdistention. It would seem that part of it, at least, is due to the fact that the uterus has to work at a mechanical disadvantage, for as soon as the membranes are ruptured the contractions are usually sufficient to terminate labor in a short time. This is not always the case, however. Quite frequently a true uterine inertia does supervene, and the second stage may be prolonged to an extent that renders operative delivery necessary.

If the diagnosis of twin pregnancy has not been made, and this is usually the case, the attendant may be at a loss to account for the delay in the first stage. These cases are among the most puzzling and trying for the young accoucheur. Not knowing the cause of delay he hesitates to rupture the membranes and the sufferings of the patient are indefinitely prolonged. The cervix does not dilate and the presenting part does not descend.

As soon as the membranes are ruptured, however, a large quantity of

liquor amnii escapes, the softened and obliterated cervix rapidly dilates, and the presenting part descends into the vagina. This part of the first stage presents a vivid contrast to the slow progress that precedes it.

One of two things may now happen. If the uterus contracts vigorously, the small fœtus is soon expelled, and if the patient is a multipara the second stage may occupy but a few minutes.

But in a considerable proportion of cases good contractions do not supervene. The uterine muscle, so long subjected to great distention, does not respond. The presenting part remains in the vagina, and the attendant again wonders at the delay.

Thus it happens that operative interference often becomes necessary in the second stage of labor. Fortunately for the patient, the small size of the fœtus makes its extraction easy.

The delivery of the first child may be followed by the delivery of its placenta, as in ordinary labor. This, however, is the exception. In rare instances the delivery of the placenta of the second child may precede the birth of the latter. In most cases the delivery of both placentæ is delayed until after the delivery of the second child.

The birth of the first twin is followed by a period of repose of greater or less duration. According to Kleinwächter the second twin is delivered in one-half hour or less after the birth of the first, but in exceptional cases hours, days, or even weeks, may elapse.

Owing to the coëxisting hydramnion, and to the fact that twins are usually of small size, multiple labor is often complicated by malpositions and malpresentations. Breech presentation is especially common, but is not as unfavorable for the child as in ordinary labor, since the extraction of the aftercoming head presents little or no difficulty (Fig. 144).

The third stage is characterized by a somewhat greater tendency than usual to relaxation and hemorrhage, due no doubt to a decrease of the tonicity of the uterine muscle, the result of prolonged distention, and, perhaps, to the greater area of placental attachment.

The same causes predispose to subinvolution, and the puerperium is usually prolonged.

Treatment During Pregnancy.—There is little that can be done for the discomfort that is so often incidental to twin pregnancy. Special care should be taken to guard against toxic symptoms. If the distention is extreme the induction of labor may become necessary. In this case it is unwise to resort to the slower methods, the rubber bag or the bougie. They are often ineffectual and the patient is in no condition to endure a long first stage and the necessary manipulations. Simple puncture of the membranes at once relieves the symptoms and labor follows in a short time. The usual objections to premature rupture of the membranes do not obtain.

Management of Labor.—Some writers advise a policy of non-interference during the prolonged first stage. This is perhaps wise, if the pains

are not too frequent or severe, and if the patient is able to secure some sleep. If not, it is better, in my opinion, to terminate labor, since nothing more is necessary than to rupture the membranes. A prolonged first stage here certainly does no good. It is an unnecessary tax upon the patient, and strongly increases the already existing tendency to hemorrhage.

Of course the attendant should be reasonably sure of his diagnosis. To rupture the membranes early in a case of pelvic contraction, or of unusual size of the fœtus, would be a disastrous mistake. If, however,

Fig. 144.—Twins, one in vertex, the other in breech presentation. (Tarnier and Chantreuil.)

there is marked distention and the fetal parts cannot easily be made out, the case is either one of hydramnion or twin pregnancy, and in either the treatment would be the same.

After rupture of the membranes a short and easy second stage is the rule. If, as is sometimes the case, operative delivery becomes necessary, it is, owing to the small size of the fœtus, almost always easy. Strong pressure with both hands over the fundus, after the method of Kristeller, often suffices to bring the small head to the floor of the pelvis, or even

through the vulva. I cannot too strongly emphasize the value of this method in these cases.

In vertex cases the forceps should be preferred to version, since, even if the head is high, it can be pushed down within easy reach, and owing to its small size no great traction is necessary and there is little compression.

After the delivery of the first child the maternal as well as the fetal end of the cord should be carefully ligated, since, if there should be a communication between the two placentæ the second twin might bleed from the cord of the first.

A careful examination should then be made to determine the position of the second child, since prolapse of the cord or some malpresentation may follow the delivery of the first. Unless there exists some indication for delivery, *e.g.*, prolapse of the cord, or a transverse position, the delivery of the second child should not be hastened. Hemorrhage is less likely to occur if the uterus is not emptied too suddenly. But the fetal heart should be carefully watched in the meantime, and if there are any indications of impending asphyxia it should be promptly delivered.

FIG. 145.—Locked twins, both in head presentation. (R. Barnes.) *A*, apex of wedge; *B C*, base of wedge which cannot pass the brim.

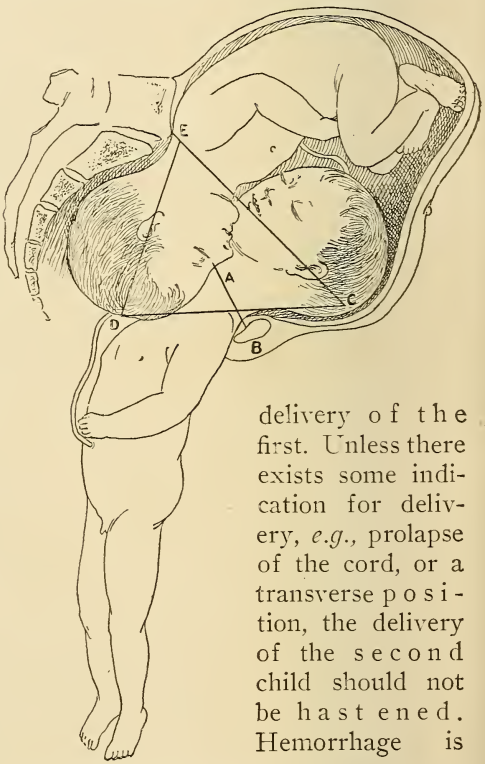

FIG. 146.—Locked twins, first child partly born in breech presentation, the second lodged with the face under the chin of the first. (R. Barnes.) *D*, apex of wedge; *E C*, base of wedge which cannot enter the brim; *A B*, line of decapitation to decompose wedge and allow trunk of the first fœtus and head of the second fœtus to pass.

It is not uncommon for the second twin to be retained for hours, and many cases are on record in which it has been retained for days, or even weeks. This, of course, increases its chances for survival.

Should the retention of the second fœtus be permitted? If the placenta of the first child is expelled, and if after some hours the condition of the

retained fœtus is found to be good as shown by the heart sounds, and if the uterus shows a tendency to reconstruct we may temporize, in the hope of giving the fœtus a better chance. On the other hand, if the placenta of the first child is retained, it is obviously unwise to leave it *in utero,* and thus incur the risks of infection and hemorrhage. If, then, at the end of an hour the placenta is still undelivered and there are no signs of uterine activity it is wise to proceed with delivery.

Among the rarities that one reads about, but does not see, is the interlocking of the heads of twins. As shown in the accompanying illus-

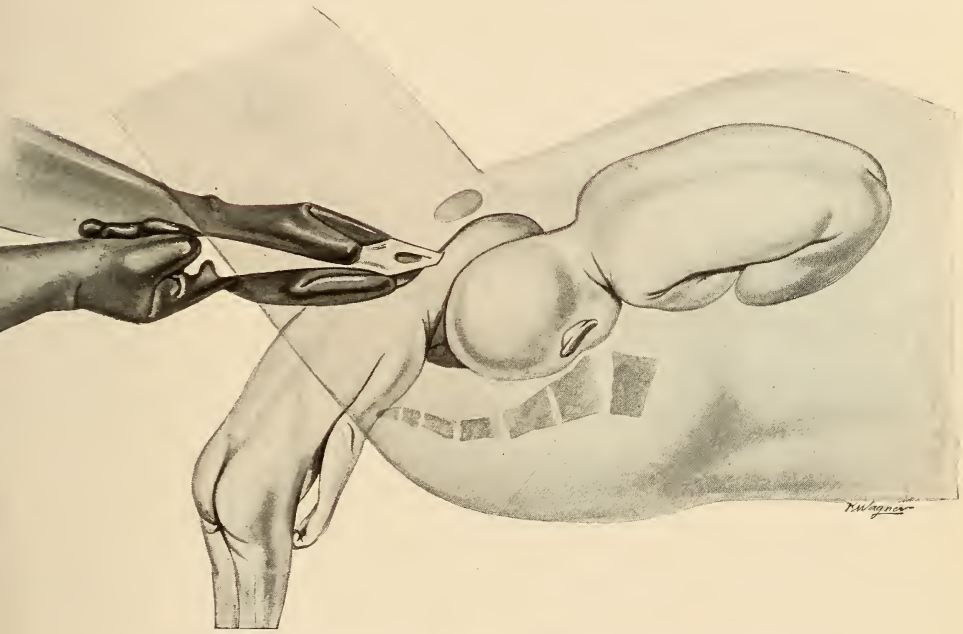

Fig. 147.—First child presents by the breech. Perforation of after-coming head.

trations (Figs. 145 and 146) this may happen in two ways. Both heads may present, or one head and one breech.

In the first case a careful attempt may be made to reduce the impaction by placing the patient in the Trendelenburg position and introducing the hand into the uterus, under full anæsthesia. If this fails, the forceps may be applied to the first head and later to the second. If the latter fails, it may become necessary to perforate the head of the first child. This child is in the greater danger from pressure on the vessels of the neck.

In the second case, if the impaction cannot be reduced, it is again the first child that is in the greatest danger, and it may be possible to decapitate it and push the head back, thus making room for the passage of the second. This will probably be easier than perforation (Figs. 147 and 148).

In either case there is little chance of the first child having survived the pressure and the necessary manipulations, and therefore little chance of the perforation of a living child.

It must be admitted that the directions usually given for the treatment of interlocking twins are academic, rather than practical, for the condition is so rare that no one has had much experience in its management. In one case Löbenstein performed Cæsarean section.

Every care should be taken to prevent uterine relaxation and hemorrhage during the third stage. Ergot should be administered as soon as the placentæ have been expelled and the patient carefully watched for at least two hours thereafter.

The lying-in period is protracted and more or less subinvolution is

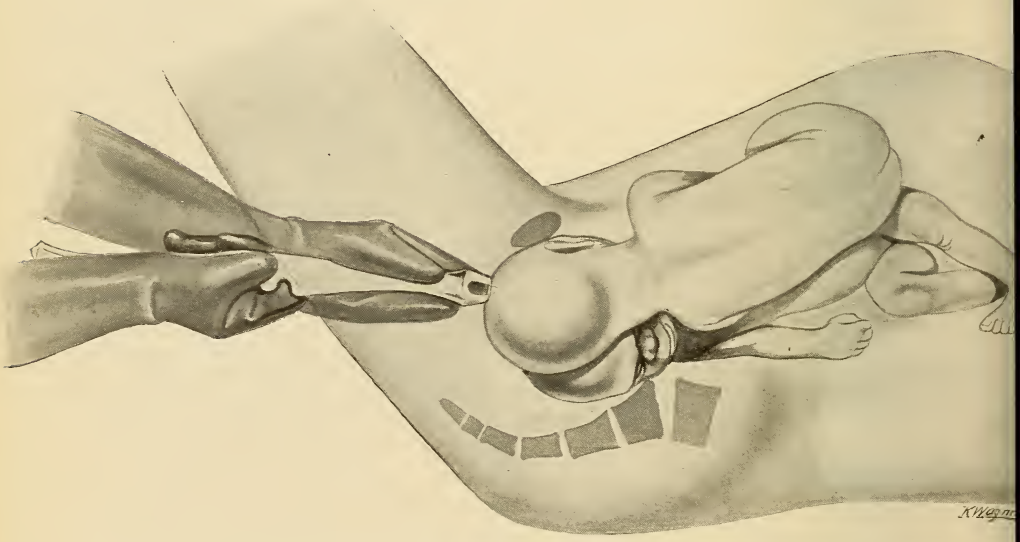

Fig. 148.—Twins. Both heads presenting. Perforation of first child.

the rule. Careful attention is indicated at this time, and the resumption of household duties should be delayed longer than in ordinary cases.

Prognosis

It is evident that the mother incurs more risk in twin pregnancy. Toxæmia and hemorrhage are more common, operative interference more often necessary, and convalescence more protracted. Nevertheless, good care usually suffices to ward off serious dangers and secure complete recovery.

For the children the prognosis is always serious. The majority are more or less premature and the mother seldom has milk enough for both. It is well to inform the parents of these facts.

PART II

PATHOLOGY OF PREGNANCY AND LABOR

A. PATHOLOGY OF PREGNANCY

CHAPTER XII

LOCAL DISORDERS OF THE MOTHER

It is obvious that pathological conditions of the birth canal may interfere with the normal progress of pregnancy and labor. Sometimes, indeed, they may prevent conception. Again, if pregnancy does occur, they may unfavorably modify its course, or bring about its premature interruption. Then, too, they may delay or complicate labor, or even make delivery *per vias naturales* impossible.

Endometritis

Perhaps the most common of these pathological conditions is endometritis in one form or another. The discussion of this subject falls naturally into two divisions, the first dealing with acute inflammatory processes, usually the result of infection during or after labor or abortion, the second, with chronic conditions, which, strictly speaking, are degenerative rather than inflammatory, and which often, though not always, prevent the development of pregnancy. Infections following labor, or more rarely occurring during labor (intrapartum infections), are discussed in the section on puerperal infection.

The endemotritis of syphilis, a local manifestation of a general disease, and the endometritis of gonorrhœa are discussed in connection with those subjects.

With the exception of the endometritis of syphilis, a local manifestation of a general disease, to be considered in the next chapter, endometritis occurring during pregnancy is the result or continuation of a process antedating pregnancy, and is essentially chronic. That a latent gonorrhœa, existing before pregnancy, may be awakened to full activity and take on acute symptoms as a result of the stimulus of conception, as claimed by some writers, has not been proven. Gonorrhœa as a complication of pregnancy, labor and the puerperium will be separately considered.

Acute decidual endometritis then is a rarity during pregnancy. The chronic form, however, is by no means rare at this time. The different forms are grouped under the name of chronic decidual endometritis. Taken together, they constitute a common cause of abortion, and present a group of symptoms which, from a diagnostic and therapeutic stand-point, are highly important.

The changes are mainly hypertrophic in character, and consist in a general thickening and hyperplasia of the mucous membrane. This appears to take the place of the normal decidual atrophy that occurs after the first few months of pregnancy. When the condition is general and symmetrical it is called diffuse. In some cases the general hypertrophy and hyperplasia are slight but there are patches of polypoid growth scattered here and there over the decidual surfaces. This is the classical polypoid endometritis of Virchow. Again the changes are most marked in the decidual glands, and are accompanied by an accumulation of watery fluid between the vera and reflexa, or, much more rarely between the reflexa

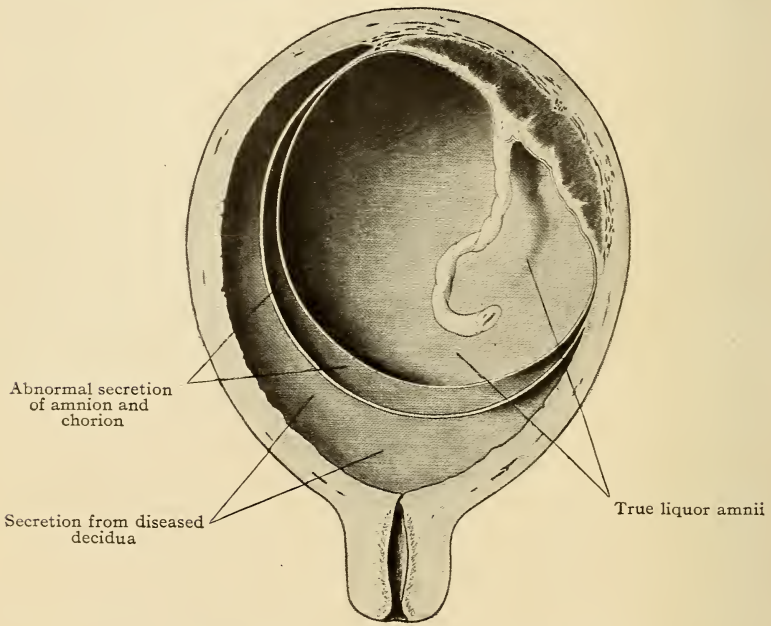

FIG. 149.—Diagram showing the different kinds of liquor amnii.

and chorion or between the latter and the amnion. This condition is otherwise known as hydrorrhœa gravidarum. It has a special clinical interest in that the watery discharges by which it is characterized often lead the physician or nurse to believe that there has been a premature rupture of the membranes. This may prove a serious mistake. Not every watery discharge that occurs during pregnancy represents a rupture of the amniotic sac. How often one hears from nurse or patient that the membranes have ruptured and yet finds on examination that such is not the case. The sources of error are well shown in Fig. 149, from Bumm.

White infarcts and other changes in the placenta may be due to changes in the decidua serotina, placental endometritis.

Hegar and others have described a condition of decidual atrophy, atrophic decidual endometritis (Figs. 150 and 151).

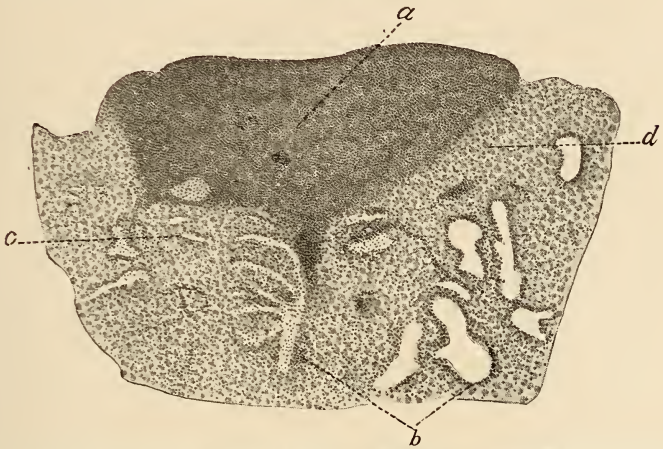

FIG. 150.—Interstitial inflammation of the decidua. (Emanuel.) *a*, wedge-shaped infiltration with small round cells; *b*, enlarged glands; *c*, small blood-vessels; *d*, glands.

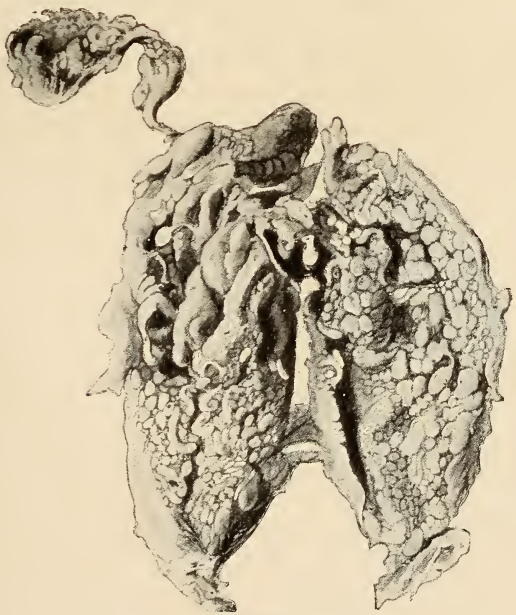

FIG. 151.—Endometritis tuberosa and polyposa. (Bulius.)

Clinical History.—Occasional pain in the back or abdomen may or may not be present. The most prominent and constant symptom, however, is the discharge from the vagina. This is usually of a reddish-brown

color and slight or moderate in amount. In the glandular variety it is usually profuse in quantity and with no intermingling of red. It may continue for weeks, or throughout pregnancy.

Prognosis.—The prognosis in these cases relates, of course, chiefly to the fœtus. Doubtless many abortions are due to endometritis, the cause not being recognized unless the expelled decidua is examined microscopically. If, however, the patient weathers the first few months of pregnancy successfully, all may be well in the end. The attendant should never give up hope in these cases. With good management one occasionally secures a living child when least expecting it.

Diagnosis.—Decidual endometritis is sometimes mistaken for placenta prævia, but in the latter condition the discharge is bright red while in endometritis it is brownish and watery.

It might also be mistaken for hæmaturia, but the use of the catheter suffices for the distinction.

The possibility of cancer of the cervix should not be overlooked. There is usually a history of endometritis antedating pregnancy.

Treatment.—Every effort should be made to put the patient in good physical condition by good diet, fresh air and tonics, especially iron if indicated. All sources of mental and physical overstrain should be sedulously avoided, and the prophylactic treatment of abortion, elsewhere discussed, carried out in every detail. Experience has convinced me that the fluidextract of viburnum prunifolium is useful in these cases. Its efficacy is perhaps increased by combining it with an equal quantity of the fluidextract of hydrastis.

Of course local treatment is not available during pregnancy, but after delivery a thorough curettage often results in the cure of the condition.

Granular Vaginitis (Colpitis Granulosa)

This is of common occurrence during pregnancy. It is of some clinical importance, since the affected parts are less succulent and therefore dilate more slowly and tear more easily than under normal conditions. Moreover, such tears are more likely to become infected, and healing is imperfect or altogether absent.

The condition is characterized by a profuse discharge and a characteristic rough granular "feel," due to the presence of enlarged papillæ of the vaginal mucous membrane.

Emphysematous colpitis (Colpitis emphysematosa) was first described by Winckel. It is peculiar to pregnancy, or, at all events, is seldom observed at other times. This curious condition is characterized by the presence in the vaginal mucous membrane of the *œdema bacillus* of Lindenthal.

Vulvitis

Owing to the eversion of the vulva, even the lower vaginal walls protruding more or less, and to the increased congestion and moisture of the

parts, a mild catarrhal, and even a granular vulvitis is common. It may be accompanied by condylomata. A common causative factor is lack of cleanliness. Mycosis vulvæ, a fungoid inflammation much resembling the "thrush" of young infants, and characterized, like that affection, by the presence of thin grayish patches, is sometimes noted.

Diagnosis.—These affections are often mistaken for gonorrhœa on account of the profuse discharge and especially of the condylomata. The diagnosis can only be made by repeated bacteriological examination.

Treatment.—As a rule cleanliness, *i.e.*, plenty of soap and water externally, is sufficient. In aggravated cases of vaginitis mild astringent injections may be used, only in skilful and careful hands. For mycosis vulvæ a 20 per cent. solution of silver nitrate is useful.

Gonorrhœa

This affection, occurring as a complication of pregnancy, is unfortunately common enough, especially in hospital practice in our large cities. The subject is an important one, commonly neglected, and deserves special attention.

As a rule, the process is present in a chronic or subacute form, and represents the continuation of a process antedating pregnancy. Often innocently acquired, and presenting no acute symptoms, its existence is usually unsuspected by the patient. Nor in the absence of a microscopical examination is the physician in a position to affirm or deny its existence. Its only symptom is an increased leucorrhœal discharge, and such a discharge is common enough in uncomplicated pregnancy. It may be necessary to make several examinations before the gonococcus is found.

More rarely an acute gonorrhœa is contracted during pregnancy. In my experience this is more frequently observed in hospital practice. Here, as in syphilitic and chancroidal lesions, the increased blood supply of the parts leads to an exaggeration of the local evidences of the condition. The bright red, almost scarlet, color of the mucous membrane, in contrast with the abundant milky discharge, makes a characteristic picture familiar to the maternity hospital interne, and one is almost safe in making the diagnosis without the microscope. To these objective signs are added the usual symptoms of urethritis.

Strange as at first thought it might seem, gonorrhœa does not greatly modify the course of pregnancy. The gonococci do not ascend beyond the cervix; at least this is the general rule. After delivery, however, conditions are quite different. The decidual barrier has been removed, the cervix is widely dilated, and even though the patient may have escaped serious injury, a multitude of minute tears and abrasions offer as many avenues for the spread of infection. Moreover the lochial discharge makes an ideal culture medium for the bacteria.

Thus it happens that the gonococci do not usually find their way into the uterus until after delivery, and the majority of patients date the begin-

ning of their troubles from this time. Tubal and ovarian disease often result and subsequent sterility is common. Every physician soon becomes familiar with the fact that women not infrequently abort and subsequently become invalids after marriage, or, more often, after the birth of the first child.

Treatment During Pregnancy.—Leaving aside the possibility of the occurrence of abortion, gonorrhœa is still a most undesirable complication of pregnancy, since it may cause: 1. Infection of the child's eyes during labor. 2. Infection of the mother during labor, or more commonly during the puerperium.

Hence it follows that the affection should be treated during pregnancy. For this purpose vaginal douches are commonly used. This treatment has never seemed to me sufficiently radical to accomplish much. My own custom is to insert into the vagina and well up against the cervix through a speculum a tampon of sterile absorbent cotton soaked in a solution of silver nitrate twenty grains to the ounce. After an hour or two the patient herself may withdraw the tampon by means of the attached string. This method, which I learned years ago from the late Dr. W. R. Pryor, usually results in a prompt cessation of the discharge, and while it may not effect a radical cure, undoubtedly diminishes the danger to both mother and child. Moreover, it is easily carried out and does not disturb the patient or have any tendency to interrupt labor. The latter cannot be said of vaginal douches, especially if administered in a careless and routine manner.

The prophylaxis of ophthalmia neonatorum is one of the most important duties of the obstetrician, but at the same time he should not forget the possibility of the contraction of the disease (gonorrhœal ophthalmia) by his assistants. House physicians and nurses should be warned of the danger and should be required, not requested, to wear rubber gloves, and to use every possible precaution. We have all seen occasional sad examples of the neglect of this rule.

Labor should be conducted as far as possible without internal examinations, and one should try to avoid the introduction of the finger within the cervix. Operative interference should be practised only in the presence of a distinct and imperative indication. All this of course to prevent the transmission of the gonococci to the cavity of the uterus.

Similar precautions should be observed during the third stage. Douches and internal examinations should be forbidden and the proper management of the third stage, as given on p. 172, carefully followed out.

It is a matter of common observation that gonorrhœal infection is usually first manifest shortly after the patient leaves her bed. At this time partly healed tears are reopened and the ascent of the gonococci facilitated. In view of this fact Bumm has advised that these patients be kept in bed, avoiding all unnecessary movements, during the entire period of involution, or, in other words, five or six weeks. Perhaps this is hardly practicable, or absolutely necessary, but I have been in the habit

of advising my patients to remain quietly in bed for at least three weeks. I recall a private case in which I expressly warned the patient and her family of the necessity of absolute rest. The patient, who was not aware of her condition, was persuaded by her mother to leave her bed a few days after delivery, and on my next visit I found her suffering from high fever and severe abdominal pain. The cause was found when, alarmed at her condition, she confessed that my instructions had been disregarded.

The prophylactic treatment of the child's eyes should on no account be omitted. This consists in the instillation into each eye of one or two drops of a one per cent. solution of silver nitrate. Subsequent irrigation with salt solution is unnecessary. In view of the demonstrated harmlessness of this procedure, and of the possible consequences of its neglect, I am in the habit of advising its routine practice. Having found the silver nitrate very effectual, I still continue its use in preference to that of the newer preparations of silver.

Tumors

Next in order of frequency as disturbing elements in the course of pregnancy and labor come the various morbid growths. The reader should not consider them merely as mechanical obstacles to the progress of pregnancy and labor. This is indeed an important, perhaps the most important, effect of their presence, but its importance is entirely dependent upon their size or location. As we go on we shall see that the mere presence of a neoplasm may, irrespective of size or location, affect the integrity and growth of the uterine structure, thus causing various bad results, *e.g.*, sterility, abortion, deficient uterine contraction with its corollaries, delayed labor, hemorrhage, retention of the placenta, etc., and, in the puerperium, infection and subinvolution.

So far as the mechanical effect of these growths is concerned, we may say in a general way that they affect the course of pregnancy more when located above the brim of the pelvis, in which position they may increase the abdominal distention and encroach upon the space required for the growth and development of the fœtus. Their effect upon the progress of labor, however, is practically nil. On the contrary, when located within the pelvis and firmly fixed, a tumor of only moderate size may render natural delivery difficult or impossible.

Myomata (fibroids)

Among the new growths that may give trouble in this connection, the myomata, or fibroids, as they are commonly called (Figs. 152 and 153), take the most important place because of their frequent occurrence. The prognosis in these cases, however, is not as bad as was formerly supposed, and the mere presence of a fibroid affords no excuse, *per se*, for a resort to heroic surgery and no ground for great apprehension. It has been the occasional experience of every obstetrician to find, while palpating the

uterus after delivery, one or more fibroids whose existence had not previously been suspected, and which had given rise to no symptoms whatever. I recall finding one in the course of a Cæsarean section.

When, however, abdominal tumors are large enough to cause much distention, or when pelvic tumors are of sufficient size to obstruct delivery, there may be a very different story to tell.

It is well to recall the fact that the existence of fibromata may prevent conception, and that the preventive treatment, to be discussed presently, should not be forgotten. It is a well-known fact that submucous fibroids and also interstitial fibroids that encroach upon the uterine cavity are

FIG. 152.—Retrocervical fibromyoma filling the pelvis. Cæsarean section at term. (Spiegelberg.)

often, though not always, accompanied by an endometritis which may prevent conception, or, if conception does occur, may lead to abortion. On the other hand, subperitoneal, or even interstitial growths that do not encroach upon the uterine cavity, do not act as a bar to conception.

How does the presence of fibromata affect the course of pregnancy? If they are small or of moderate size, and especially if they are of the subperitoneal variety, not at all. Even considerable invasion of the body of the uterus by interstitial growths does not always prevent conception and the completion of pregnancy.

In the case of very large tumors there is often irregular bleeding which helps to obscure the diagnosis, and abortion and premature labor are more

common than in uncomplicated pregnancy, though not as much so as might be expected. In some cases, happily not very common, the distention is too great to be borne. Myomata grow very rapidly during pregnancy and, if the tumor is very large, the combination of growing uterus and growing tumor may cause severe pressure symptoms, *e.g.*, pain, dyspnœa, and interference with the return circulation, that imperatively demand relief. Sometimes the symptoms are less acute, consisting of heaviness and discomfort in the abdomen, and marked œdema of the feet and legs, especially at night. The cause of the rapid growth of myomata during pregnancy is doubtless to be found in the congestion and serous infiltration common to all the pelvic structures at that time. In some cases the tumors

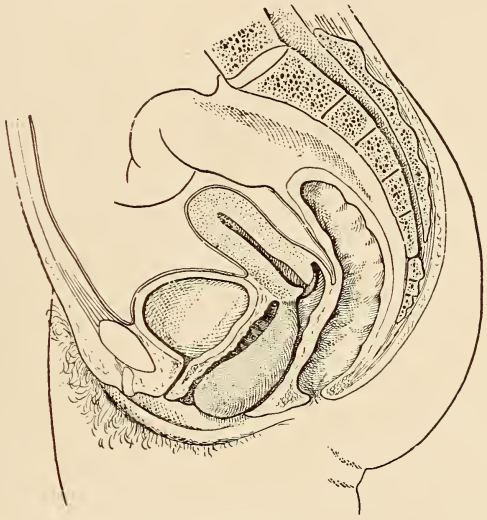

FIG. 153.—Fibrous polypus of cervix occupying the vagina. (Toison.)

become softened and the infiltration of serum between the ultimate muscular elements of the tumor results in the formation of cysts which serve to obscure the diagnosis, the operator perhaps thinking that he has to deal with a cyst of the ovary; a strange parallel to the fact that an ovarian cyst confined in the pelvis may, by the pressure to which it is subjected, acquire a stony hardness which leads the examiner to believe that it is a fibroid. Montgomery has observed cases in which severe pain attended partial rotation of the uterus caused by the presence of large tumors in the anterior and posterior walls.

What is the effect of these growths upon the progress of labor? Abdominal tumors do not usually constitute a serious obstacle to the progress of labor. In the majority of cases they do not interfere with it at all. In some cases, however, probably in those of extensive interstitial involvement, the uterine muscle is incompetent for its task, the con-

tractions are weak and ineffectual, and labor is delayed. Then, too, tumors that encroach to any great extent upon the uterine cavity naturally result in the production of malpresentations, *e.g.*, those of the breech. On the whole, however, these complications are rare. As long as there is no great change in the size or shape of the uterine cavity, subperitoneal growths, even if numerous and of considerable size, are usually quite harmless; and by some wonderful provision of nature, even extensive interstitial degeneration does not always interfere with the normal progress of labor (Figs. 152 and 153).

There is more likely to be trouble in the third stage. If there is much involvement of the uterine wall, the lack of contractile power may result in retention of the placenta or hemorrhage or both. In these cases manual removal of the placenta may be necessary. If hemorrhage occurs no time should be wasted in useless efforts to secure uterine contraction, but the uterus should be promptly and thoroughly packed. I recall a case of this kind which terminated fatally before my arrival. My impression at the time was that had the placenta been promptly removed, and the uterus packed, the unfortunate ending might have been averted. Necroses of the tumor, from pressure of the fetal head during prolonged labor or operative delivery with resulting sepsis, are a possibility not to be forgotten. This, however, is usually evidence that delivery should have been accomplished by other means.

As might be expected, involution proceeds more slowly and the puerperal period is prolonged, but as though to compensate for this, the growths themselves sometimes undergo a kind of involution and practically disappear. A fibroid as large as the fetal head has been known to disappear, and thus permit a subsequent labor to proceed normally.

Tumors that occupy the pelvic cavity, however, may constitute an insuperable obstacle to delivery *per vias naturales*. In the case of these tumors one can never tell in advance what the course of labor will be. They are the *tumeurs à surprise* of the French writers. Many of them are drawn up above the brim by the retraction of the lower uterine segment that forms part of the first stage. Others can be dislodged by cautious manipulation. With some reduction cannot be accomplished without the use of dangerous force.

Tumors of the cervix, if of any size, are sure to cause dystocia, since they cannot rise above the pelvic brim. They are doubly undesirable, because they not only obstruct delivery, but interfere with cervical dilatation. If the tumor happens to have a long pedicle it may be pushed out before the fetal head. This, however, is rare.

Tumors of the broad ligament are unfavorable, because, being fixed by adhesions, they cannot ascend above the pelvic brim. Interstitial growths of the posterior wall, when situated low down, are very apt to be caught below the promontory of the sacrum, and to constitute a serious bar to delivery.

Very rarely a rapidly growing tumor occupying the pelvic cavity may become incarcerated below the brim of the pelvis. Tumor and uterus together form a mass so large that it cannot rise above the brim of the pelvis. The condition is attended by persistent abdominal pain and obstinate constipation. If not relieved it can only progress to a fatal termination.

Diagnosis.—The diagnosis of abdominal tumors is not always easy, even in the second half of pregnancy. The situation is further confused by the fact that menstruation, or at least an irregular bleeding often mistaken for menstruation, continues.

The rapid increase in size of the tumor is significant. No other tumor grows as fast as does the pregnant uterus, and when pregnancy and tumor coëxist, this rapidity is sometimes astonishing.

The breast changes are of no great value here, since they may be present in any condition in which the uterus becomes enlarged and congested. This is also true of Chadwick's sign, and other evidences of local congestion. Much more suggestive are the subjective symptoms, morning sickness, etc., and the history as given by an intelligent patient.

In experienced hands the best results are obtained by external palpation and by auscultation. Owing to the presence of the tumor it may be impossible to map out the fetal parts or even to determine the fetal position, which, as might be supposed, is often abnormal. The recognition, however, of fetal movements, or fetal heart sounds, by a competent observer is final.

When the tumor is in the pelvic cavity the diagnosis is easy. Even when the tumor cannot be separated from the uterus and definitely mapped out, the extreme hardness of the lower uterine segment gives a sensation entirely different from that of the boggy softness of the normally pregnant uterus. The softened cervix projects like a nipple, as DeLee says, presenting a vivid contrast to the surface from which it springs. External examination is easier, and with care the positive signs of pregnancy can be elicited.

Treatment.—This is best considered under three heads:

1. The prophylactic treatment, *i.e.*, the surgical or other treatment of those patients who, being the subjects of fibroid growth, desire to become, or are likely to become, pregnant.
2. The treatment during pregnancy.
3. The treatment during labor.

The prophylactic treatment is a subject of importance, but one generally neglected. Although pregnancy complicated by the existence of fibroids usually terminates fortunately, there are many exceptions to this rule, and the danger is sufficiently great to warrant surgical interference whenever the location or size of the tumor is such as would be likely to disturb the course of pregnancy or labor, or when the tumor, whatever its size or location, is productive of symptoms. In my experience small

subperitoneal growths of the body and fundus are very common, have no special significance, and need no special treatment.

The operation selected will of course depend upon the circumstances attending the individual case. Montgomery reports a case in which he enucleated thirteen interstitial growths, the patient becoming pregnant nineteen months later and being delivered of a healthy child without serious mishap. This of course is an extreme case but serves to show what can be accomplished.

Treatment During Pregnancy.—In the great majority of cases an expectant plan should be followed. The induction of abortion, formerly practised in the hope of avoiding possible dangers and complications, is not advisable, since in many cases the process cannot be satisfactorily completed. Bitter experience has shown that removal of the secundines is often difficult and that hemorrhage and sepsis are common. The myomatous uterus does not contract well.

If hemorrhage, severe pain or marked pressure symptoms offer a positive indication for interference, the patient should be removed to a hospital and placed under the care of a thoroughly competent operator. If the symptoms are due to the incarceration of a pelvic tumor a very cautious effort at reduction should be made under anæsthesia and with the patient in the Trendelenburg position. The effort should not be long continued, and the exercise of much force is likely to result in disaster.

If this attempt fails, and in all cases in which the symptoms are apparently due to an abdominal tumor, the abdomen should be opened and the case treated according to indications. Strangely enough operative procedures do not, as in the case of ovarian cysts, appear to increase the tendency to abortion, and the ample blood supply of the pregnant uterus promotes the rapid repair of operative wounds. Therefore, if the child is not viable and the removal of the tumor appears to be attended by no great danger to the mother, excision or enucleation should be performed according to indications. If, on the other hand, the required operation will seriously imperil the mother's life, hysterectomy should be performed.

If the child is viable it should be removed by Cæsarean section, after which the tumor is removed or hysterectomy performed according to indications.

Treatment During Labor.—If there is no pelvic obstruction, the treatment should be expectant, the attendant bearing in mind the somewhat increased probability of malpresentations, of hemorrhage, and of placental retention. Usually there is no need of active treatment (Fig. 154).

If there is a pelvic tumor that is apparently so large and so firmly fixed as to make delivery improbable or very difficult, the Cæsarean section should be performed and followed by the removal of the uterus, or by excision or enucleation of the tumor, according to circumstances. I recall a case in which continued bleeding from the site of the uterine incision made necessary the removal of the uterus. Fortunately this is not common.

In the case of a single tumor, whose removal promises to be easy, it is better to avoid hysterectomy, since the latter operation is attended by more shock. If, however, the uterus is honeycombed with interstitial growths, its removal is undoubtedly the safer procedure (Fig. 155).

If the tumor is of moderate size, causing only partial obstruction, the case should be watched for a time in the hope that with the progress of cervical dilatation and uterine retraction, it may rise above the pelvic brim.

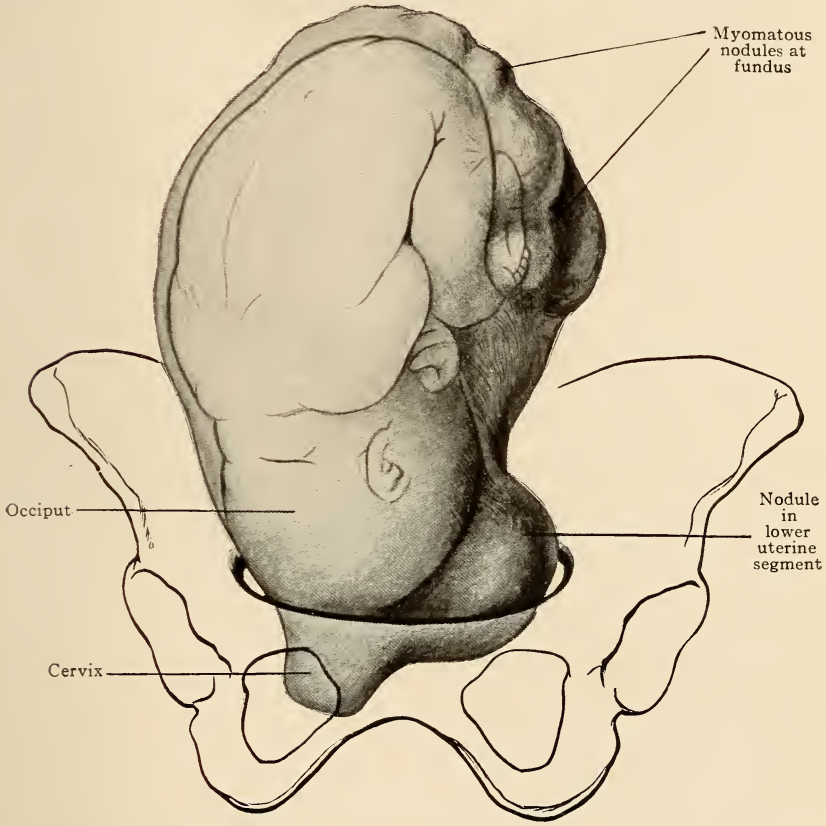

Fig. 154.—Large myoma obstructing pelvic inlet.

If this does not occur, a cautious effort at reposition may be made as already described.

If the attempt at reposition fails, as it is very likely to do, if cervical dilatation ceases and spontaneous delivery seems improbable, and if the child is living and viable, the question arises whether it shall be delivered *per vaginam* by means of version or the forceps, or whether Cæsarean section shall be performed. Unless the obstruction is comparatively slight, the latter operation is to be preferred. With modern methods it is

decidedly less dangerous both to mother and child, than an attempt to drag the fœtus through the obstructed birth canal. If the fœtus is dead, embryotomy should be promptly performed.

Pediculated tumors that are accessible should be extirpated as soon as possible.

During the third stage the physician should be on his guard against hemorrhage and retention of the secundines. As already noted, hemorrhage should be treated by the prompt and thorough application of the

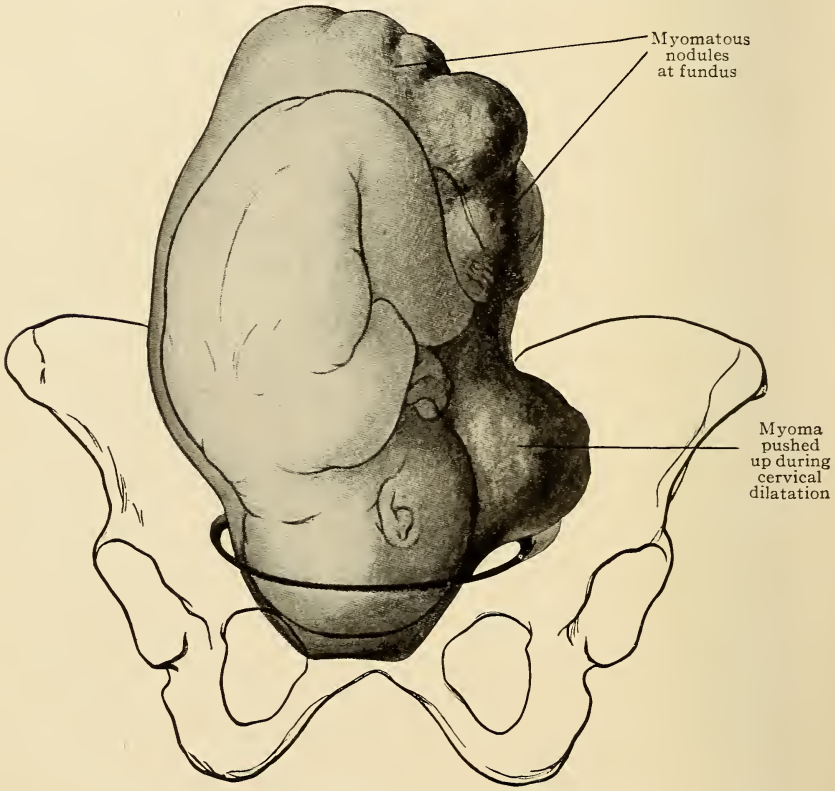

Fig. 155.—Same uterus as Fig. 154 during period of dilatation.

uterine tampon. During the puerperium hemorrhage is diminished and involution promoted by the administration of small but repeated doses of ergot; fifteen or twenty drops of the fluidextract three or four times a day.

OVARIAN CYSTS

Cysts of the ovary are much less frequent during pregnancy than the fibromata. This is fortunate, for an ovarian cyst constitutes a much more serious complication than does a fibroma. Not only is abortion much more

frequent, but certain serious accidents are likely to occur. Among these are torsion of the pedicle, rupture of the cyst, intracystic hemorrhage, infection of the cystic contents, and pressure symptoms similar to those already considered in connection with fibromata (Fig. 156).

Diagnosis.—When the tumor occupies the abdominal cavity the diagnosis is somewhat more difficult than in the case of the fibromata which, owing to their hardness, can be more easily differentiated from the uterus proper. A large ovarian cyst with its fluid contents resembles the pregnant uterus with its contained liquor amnii. The combination of such a cyst with pregnancy has led to the diagnosis of hydramnion or twin

Fig. 156.—Head arrested at brim by an ovarian cyst. (Tarnier and Budin.)

pregnancy. Small pediculated cysts are more easily made out. There is usually a history of amenorrhœa.

When the tumor occupies the pelvic cavity it is easily made out but, owing to the pressure to which it is subjected, it may be so hard as to simulate a fibroid.

Effect Upon Pregnancy and Labor.—Leaving aside the accidents mentioned above, the mere presence of an abdominal cyst has little or no effect upon the course of pregnancy. Nor is the course of labor materially influenced. If, however, a cyst occupies the pelvic cavity, it may, of course, prove an obstacle to delivery. Owing probably to the traumatism of labor, infection of the cystic contents is quite common.

Treatment During Pregnancy.—As a rule it is better to remove the affected ovary as soon as the diagnosis is positive. To this it has been

objected that abortion follows the operation in twenty per cent. of cases. It occurs, however, in seventeen per cent. of the non-operative cases, and in view of the accidents that threaten both fetal and maternal life, the difference is not marked.

To this rule, however, as to most rules, certain exceptions may be admitted; for example, if the patient is childless and elects that pregnancy shall continue, after its risks have been fully and fairly stated, or when the other ovary is affected, and there is no hope of another pregnancy. If pregnancy has advanced to the seventh month one might venture to let it go on a month longer in order to secure a viable fœtus.

According to Jeannin there is one case in which it is better to defer the operation for reasons purely surgical, *viz.*, when the pregnancy has gone on to six or seven months and the cyst is confined below the pelvic brim. In such a case the presence of the gravid uterus makes the removal of the cyst a matter of great difficulty, and it is better to allow the patient to go to term, when the conservative Cæsarean section may be performed and the tumor removed.

In the few cases in which it seems permissible to defer the operation the patient should be placed in a good hospital, or, at least, under strict and constant surgical observation.

In ovariotomy performed during pregnancy the uterus should be handled as little as possible and full doses of morphine should be given hypodermically in order to prevent abortion.

Treatment During Labor.—If the cyst is in the abdominal cavity, the management of labor does not differ from that which obtains in uncomplicated cases.

If it is located in the pelvis a very gentle effort at reduction may be allowed. For this purpose the patient is placed in the Trendelenburg position, and the fetal head gently lifted upward and out of the way. Only the most gentle efforts are permissible, and if they fail no attempt should be made to drag the head past the tumor, even though the disproportion be slight. All rough handling of the tumor is prone to cause bruising or rupture with resulting infection. The Cæsarean section should be practised unless infection is already present, or the patient's general condition is so poor as to contra-indicate an abdominal section. In such cases the tumor should be removed by the vaginal route.

During the puerperium the patient should be narrowly watched and the tumor removed at the first indication of trouble.

Cancer of the Cervix Uteri

This is the most formidable complication of all. Fortunately it is rare, occurring only about once in two thousand cases. The patients are usually between thirty and forty years of age. The symptoms and diagnosis are the same as in the non-pregnant condition, differing in degree rather than in kind. Owing to the serous infiltration and increased blood supply, the

disease pursues a more rapid course. Hence the great importance of early recognition. The first symptom is the appearance of a bloody or offensive discharge. As we have seen in connection with placenta prævia, such a symptom should never be neglected. Owing to the rapid spread of the disease the general condition deteriorates rapidly. The cachexia is pronounced and the debility progressive. Hemorrhage is more prominent than in the non-pregnant state. Premature interruption of pregnancy occurs in two-thirds of the cases (Bar).

Treatment During Pregnancy.—The treatment to be adopted depends upon the stage of advancement. In other words, upon whether the cancer is operable or inoperable.

If the disease has not extended beyond the cervix, if in the judgment

Fig. 157.—Retroflexion of the gravid uterus. (Swytzer.)

of an experienced gynæcologist there is a reasonable hope of saving the life of the mother, hysterectomy should be performed and the operation should be as radical as is consistent with her safety. If the child is viable it should of course be delivered by Cæsarean section before the uterus is removed.

If the case is inoperable, the only task left the accoucheur is the melancholy one of keeping the mother in as good condition as possible in order that she may at least live to give birth to her child. At the end she is delivered *per vias naturales,* or by the Cæsarean section, according to circumstances.

Treatment During Labor.—If the disease is in its initial stage and the cancerous infiltration is slight, spontaneous labor may occur, or delivery

may be accomplished by forceps or version. In the first stage of labor, therefore, the treatment should be expectant. The attendant should watch the progress of labor, and especially of cervical dilatation. If dilatation does not occur after a reasonable time the Cæsarean section should be performed, and followed by hysterectomy. Attempts at manual or instrumental dilatation are dangerous in these cases. The infiltrated and hardened tissues tear easily, and serious or even fatal hemorrhage may result.

In addition to the neoplasms mentioned above there are various unusual forms of obstruction that do not admit of classification and to some of which we have referred elsewhere. Among these are solid tumors of the ovary, cancerous growths in the bladder or rectum, vesical calculi, etc.

The kidney has been known to become prolapsed and obstruct the progress of labor. Obstruction from an extra-uterine pregnancy coexisting with a normal pregnancy is a rare and curious phenomenon.

Obstruction from echinococcus cysts, and from old masses of inflammatory exudate, have been observed. Pelvic tumors, *e.g.*, osteosarcomata, exostoses, etc., are discussed in the section on pelvic contraction.

In all these cases the general principles of treatment are the same, but the details will vary with the individual case. In a general way it may be said that any operable tumor which promises to prove a serious obstruction should, except for good reasons to the contrary, be removed during pregnancy, and that inoperable tumors should be left until the beginning of labor, when the Cæsarean section should be performed and followed by hysterectomy or such other surgical treatment as seems best to fit the circumstances of the case.

Retroversion and Retroflexion of the Gravid Uterus

As we have already noted, marked anteversion is the normal position of the pregnant uterus. In the exceptional cases in which it is retroverted or retroflexed, it is found in the hollow of the sacrum and its ascent may be hindered by the projecting promontory.

Frequency and Etiology.—This accident is one to which the textbooks devote much attention, but which, at least in its aggravated form, is very rare in America. It may, however, be an occasional and usually unrecognized cause of abortion, and especially of abortions occurring in successive pregnancies and always at about the same time, *i.e.*, during the second or third month. It appears to be much more frequent in central Europe, probably because of the greater frequency of contracted pelvis. Long standing, as in the case of patients whose household cares allow them little time for rest, is a predisposing cause. The constant pressure of the abdominal contents is a factor in preventing the ascent of the fundus. In some cases the descent of the fundus is prevented by inflammatory adhesions.

As a rule the retrodeviation of the uterus antedates pregnancy, though instances of its occurrence during pregnancy as the result of traumatism have been reported.

Terminations.—Ordinarily the natural forces are sufficient to overcome the difficulty. The contractions of the anterior wall are sufficient to draw up the body of the uterus, the cervix meanwhile being "stemmed" against the symphysis, which serves as a fulcrum (Chrobak). Reduction is much more likely to occur in cases of retroflexion than in those of retroversion, since the long, comparatively straight uterus of retroversion

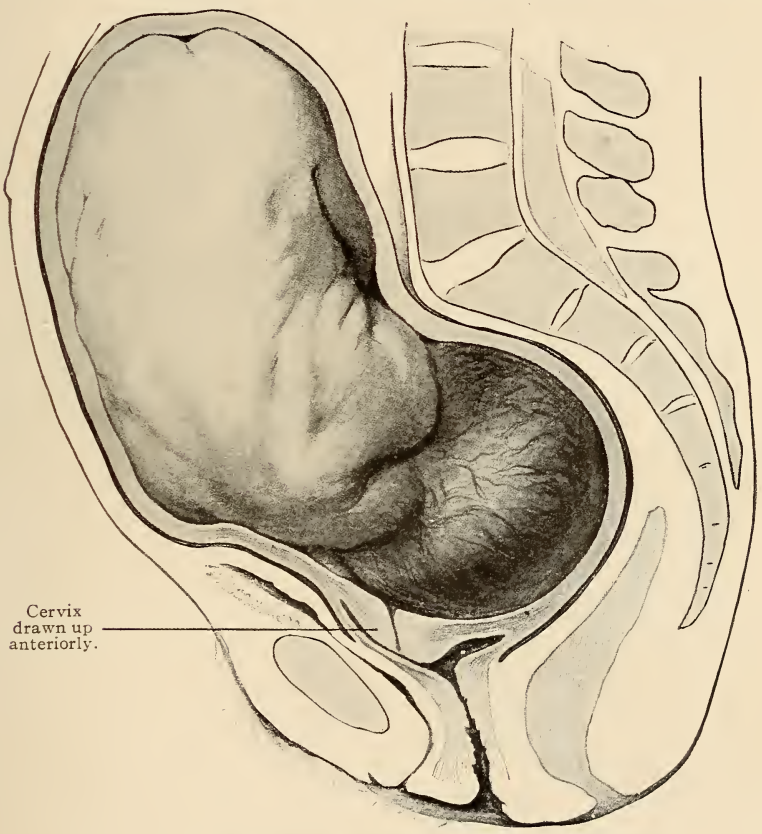

Fig. 158.—Retroflexed uterus, partially replaced at end of pregnancy.

not only occupies more space anteroposteriorly, but catches above the symphysis in front, and below the promontory behind.

In some cases, fortunately rare, the obstruction is too great and the uterus becomes incarcerated below the promontory. Three results may now follow:

The patient may abort.

Partial reposition (sacculation) may occur.

The uterus may become incarcerated beneath the promontory.

A word is necessary here as to what is meant by partial reposition or

sacculation. Here the posterior wall of the uterus remains adherent in the pelvis, and the anterior wall is stretched upward in a manner analogous to that which obtains in cases of anterior fixation. Under these circumstances the symptoms are much milder and it may even happen that pregnancy will continue. In this condition, however, the cervix is drawn up anteriorly instead of posteriorly, and the presenting part in the pelvis distends the posterior not the anterior wall. The condition is made clear in Fig. 158.

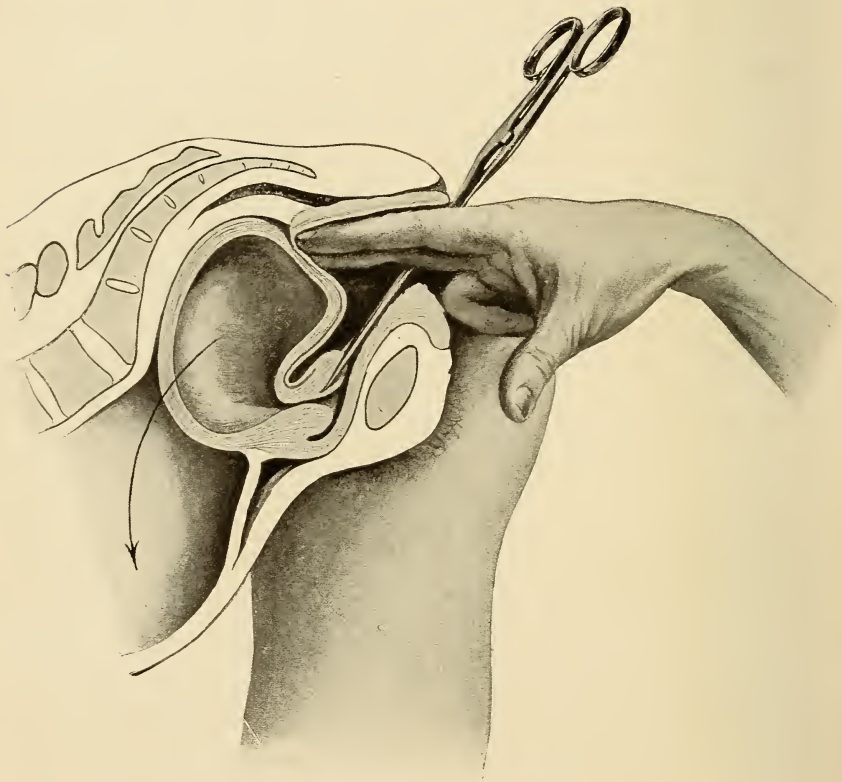

Fig. 159.—Pushing up the incarcerated uterus, with aid of knee-chest position.

Clinical History.—The earlier symptoms are often disregarded, and the physician is usually first consulted during the fourth or fifth month, on account of painful urination or retention of urine. The former symptom may be the result of an acute gonorrhœa, but the latter is very rare in early pregnancy, and the attendant should always search carefully for the cause. In these cases it is at once disclosed by vaginal examination. The finger at once comes upon the corpus uteri distending the posterior *cul de sac* and perhaps pressing upon the vaginal wall and

rectum so as completely to obstruct the passage of fæces. The cervix, not felt at first, is found far up anteriorly behind or even above the symphysis.

In neglected cases the familiar symptoms of paralysis from overdistention soon follow. There is abdominal pain and swelling together with dribbling of ammoniacal urine. The bladder may reach to the umbilicus. If the condition is still unrelieved, rupture or gangrene of the bladder may develop, and death from exhaustion or sepsis ensue.

Prognosis.—This is good if the complication is discovered early and treated properly. Neglected cases usually involve the loss of the child and serious danger to the mother.

Treatment.—The first thing to do is to empty the bladder. For this the ordinary catheter may not suffice, since the urethra and neck of the bladder are enormously stretched. A prostatic catheter, or a long English webbing male catheter, may succeed. The passage of the catheter may be facilitated by drawing the cervix downward and backward with the volsellum.

The bladder having been emptied, an effort is made to push the uterus upward and backward, at the same time guiding it a little to one side of the promontory if necessary. Here again assistance may be afforded by drawing the cervix downward and backward. Before resorting to anæsthesia, reposition should be attempted with the patient in the knee-chest position (Fig. 159).

After the uterus has been replaced it should be kept in position by a vaginal tampon, or by a globe or ring pessary.

If attempts at reposition fail, and if there are no evidences of infection or gangrene, laparotomy may be performed and the uterus lifted above the brim, adhesions being separated if necessary. If, however, the conditions are unfavorable for laparotomy, abortion becomes the only resource. This may sometimes be accomplished by rupturing the membranes with a highly curved sound. In some cases, however, especially in retroversion when the cervix may point directly upward, this cannot be accomplished. In this emergency one may adopt the method of puncturing the body of the uterus at its most prominent part with an aspirating needle of medium size and allowing the amniotic fluid to drain away. The uterus grows rapidly smaller and is easily replaced. Strangely enough abortion does not always follow. Bumm observed one case in which pregnancy continued until term and terminated normally.

Severe dystocia has also followed the Mackenrodt operation of vaginal fixation in a large proportion of cases, and it seems clear that this and similar operations should be proscribed during the lying-in period (Fig. 160).

During pregnancy treatment can be only palliative. Toward the end anodynes may be needed.

In labor the treatment *depends altogether upon the location and condition of the cervix.* If the latter can be reached and drawn down

without great difficulty, and this is usually the case, delivery can probably be effected *per vias naturales*. If not, the Cæsarean section is to be preferred.

Prolapse of the Uterus

Prolapse of the pregnant uterus is encountered now and then by every worker in the field of obstetrics. Conception may occur before complete prolapse, or after. As has been frequently shown, even complete prolapse is not necessarily a bar to conception. More commonly, however, there is already a prolapse of the second degree, and the increased weight of the uterus of early pregnancy helps to make the prolapse complete.

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Fig. 160.—Dystocia following ventro suspension. (After Williams.)

In the great majority of cases spontaneous reposition occurs by the end of the seventh month. At this time the uterus has become too large to escape below the brim of the pelvis. Complete prolapse at the end of pregnancy is an impossible condition. Sometimes one sees the cervix protruding from the vagina at this time, and the clinical picture reminds one of complete prolapse, but the real condition is one of incomplete prolapse with hypertrophy of the cervix. Strangely enough, the condition does not complicate labor to any great extent. With the retraction of the uterus the cervix is drawn up over the head and disappears from view, not to be seen again until after labor.

In exceptional cases the uterus becomes incarcerated below the pelvic brim. Here nature usually comes to the rescue and the incarceration is relieved by the expulsion of the uterine contents. Cases of persistent incarceration, with gangrene of the uterus, have, however, been reported.

Treatment.—In early pregnancy the patient should avoid standing and should remain in bed, or at least in the recumbent position, several

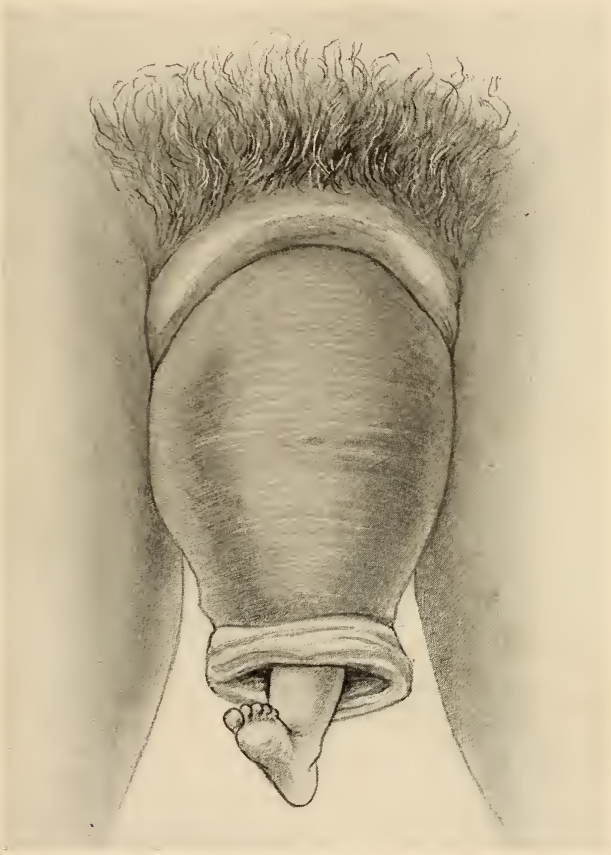

FIG. 161.—Prolapsed pregnant uterus. (Wagner.)

hours a day. If the prolapse is marked the uterus should be supported by a pessary. Owing to the weight of the uterus and the relaxation of the pelvic floor, ordinary pessaries are useless or injurious. Excellent results are obtained, however, by the use of a cup pessary, which is attached to a belt worn about the waist (Fig. 161).

Persistent incarceration demands the immediate emptying of the uterus.

Hernia of the Pregnant Uterus

In rare instances the pregnant uterus has found its way into the sac of an inguinal or umbilical hernia, or more commonly between the recti muscle (ventral hernia). A one-horned uterus easily finds its way into the sac of an inguinal hernia (Figs. 162 and 163).

Treatment.—There is little on record with reference to the treatment. Prudent attempts at reposition are indicated. In one case Winckel performed Cæsarean section.

Fig. 162.—Pregnant uterus in sac of inguinal hernia. (Winckel.)

Structural Anomalies of the Uterus

It is self-evident that structural anomalies of the uterus may modify the course of pregnancy and labor. Fortunately such anomalies are of infrequent occurrence. We will recall here a few of the most common.

double uterus (uterus duplex)

The reader will recall that the uterus and vagina are the product of the union of the two Müllerian ducts. When this union either in whole or in part fails to occur, various forms of double uterus or double vagina, or both, may result. As obstetric complications they are of comparatively rare occurrence. The uterus arcuatus, by which is meant a uterus with a visible fissure or depressior at the fundus, is quite common, and serves

hardly any other purpose than to remind us of the developmental origin of the uterus, or now and then to suggest the possibility of twin pregnancy.

The following varieties are of clinical importance (Figs. 164–170):

UTERUS DIDELPHYS

Here there has been no coalescence of the Müllerian ducts at all, and as a result we find two uteri entirely separate from each other. These uteri, however, are not complete. Each uterus, or, more correctly speaking, half uterus, has its own Fallopian tube and round ligament, and each its own cervix, but the vagina may or may not be double (Fig. 171).

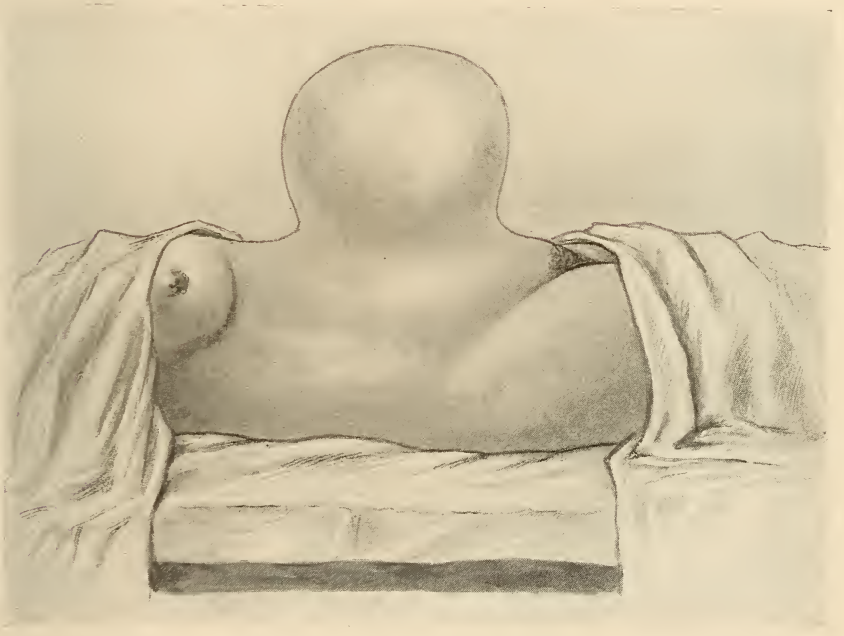

FIG. 163.—Diastasis of recti muscles with hernia of pregnant uterus. (Adams.)

UTERUS BICORNIS

In the case of this anomaly the ducts of Müller have not been completely separated and the uterus, while divided into two parts or "horns" above, is practically one cavity below, or, at most, divided into two parts by a septum more or less complete. There may be one cervix or two. As a rule there is but one vagina.

UTERUS UNICORNIS

If one of the ducts of Müller is absent the result is the so-called *uterus unicornis,* a long half-uterus, curving outward at the top and ending in a point. Along with the *uterus unicornis* there may be a rudimentary horn

having as a rule no connection with the uterus, but yet, as we shall presently see, capable of containing the product of conception.

Diagnosis.—This is often difficult. Palpation may show an exagger-

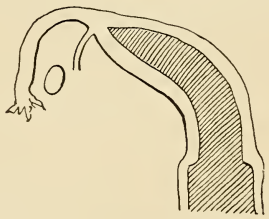

FIG. 164.—Uterus Unicornis.

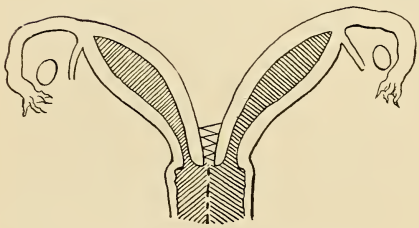

FIG. 165.—Uterus Pseudo-Didelphys.

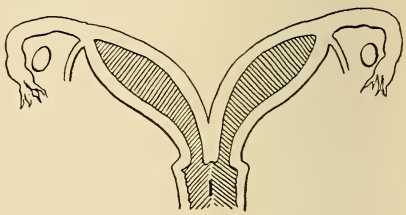

FIG. 166.—Uterus Bicornis Duplex.

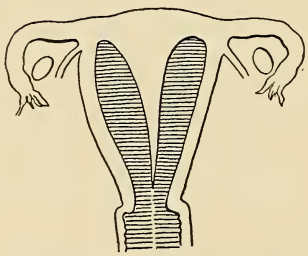

FIG. 167.—Uterus Bicornis Septus.

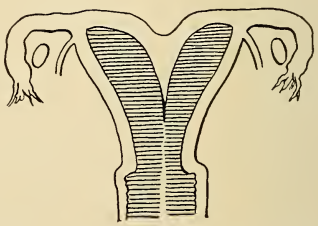

FIG. 168.—Uterus Bicornis Subseptus.

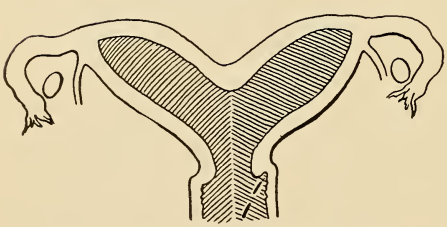

FIG. 169.—Uterus Bicornis Unicollis.

FIG. 170.—Uterus Bicornis Unicollis with Rudimentary Horn.

FIGS. 164–170.—Diagrams of uterine malformations. (Kehrer.)

ated *uterus arcuatus, i.e.*, a deep cleft in the middle of the fundus; or in the case of the uterus unicornis, the extreme lateral obliquity of the uterus together with the absence of a typical fundus. These signs, especially the

first, are suggestive, if present, but are often absent. Careful bimanual examination may reveal an empty horn. Double cervix and double vagina, if present, are, of course, highly suggestive.

Clinical History.—Pregnancy in a double uterus does not, as might at first be supposed, necessarily lead to disaster. In many cases the double

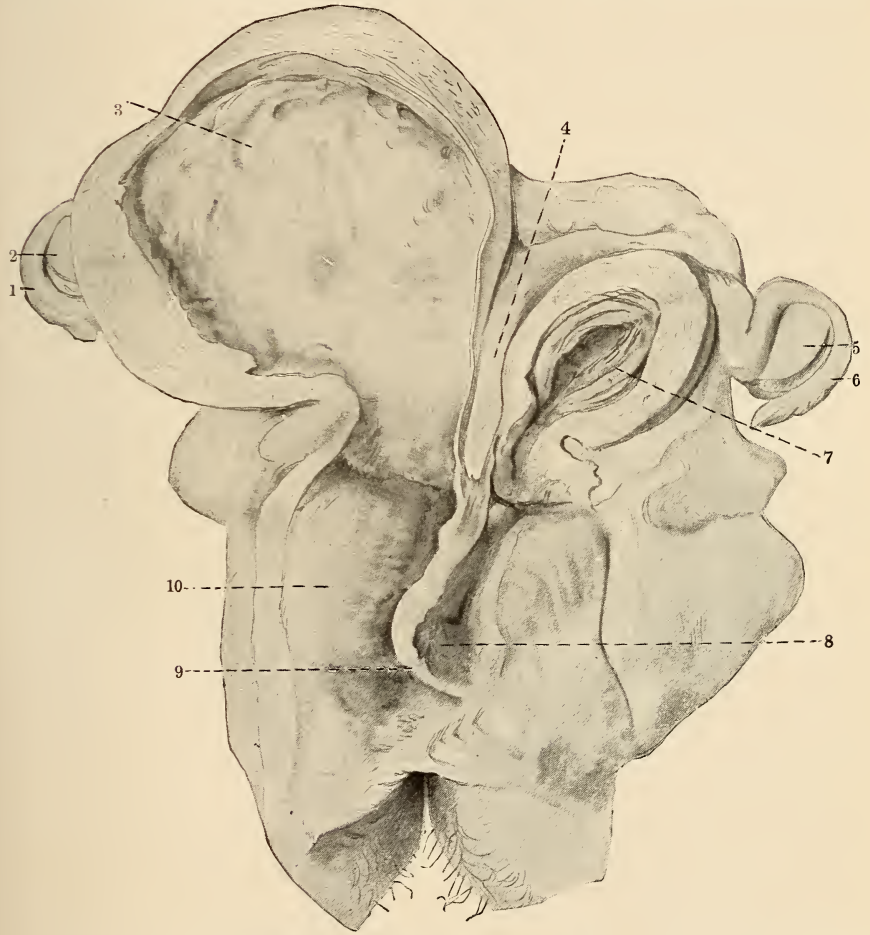

FIG. 171.—Uterus duplex separatus, or uterus didelphys. (Nagel.) 1, right tube; 2, right ovary; 3, right uterus, in which the fœtus was developed; 4, rectovesical ligament; 5, left ovary; 6, left tube; 7, left uterus with decidua; 8, left vagina; 9, vaginal septum; 10, right vagina.

uterus is not discovered until the patient has passed through one or more uneventful labors. Uterine inertia and hemorrhage are, however, somewhat more common than under normal conditions, since the uterine muscle is not fully developed. Hemorrhage is especially to be feared when the placenta is developed upon the thin septum which separates the two cavities of a double uterus.

When there is pregnancy in one-half of the uterus there is hypertrophy of muscle and mucous membrane in the other, but no decidual development. Owing partly to the irregular asymmetrical development of the uterus, and partly to the fact that the unimpregnated but hypertrophied fellow-uterus may prove an obstruction, there is an increased tendency to malpositions and malpresentations, and to placental retention. The latter complication is also favored, of course, by the defective muscular power of the organ.

In the uterus unicornis pregnancy and labor usually run an uneventful course.

Uterus with a Rudimentary Horn

Of all the malformations this possesses the greatest clinical significance. The horn may communicate freely with the uterus, but this is the exception. Usually there is no hope of natural delivery; the spermatozoa may enter but only to fertilize an ovum which later finds no way of escape aside from rupture of the horn. Oftentimes there is no apparent means by which the spermatozoa can reach the horn at all. In these cases, it is conjectured that they pass through the Fallopian tube of the developed uterus to the fimbriated extremity, and here fertilize an ovum which wanders across the peritoneal cavity and enters the tube of the opposite side, or that the spermatozoön may wander alone to the ovary of the opposite side, and here fertilize an ovum, which later finds its way into the tube, and eventually into the cavity of the rudimentary horn.

Diagnosis.—The condition is often, indeed usually, mistaken for extra-uterine pregnancy; but since the treatment is practically the same, this is no great misfortune. There is, however, one means of diagnosis which is available whenever the round ligaments can be felt. The ligament of the rudimentary horn runs inward instead of outward, as is normally the case, and as is the case with the developed uterus of the other side. As in extra-uterine pregnancy, however, the diagnosis is usually first made after the abdomen has been opened.

Prognosis.—This is good if suitable treatment is instituted in time. Otherwise it is exceedingly grave since, as in extra-uterine pregnancy, rupture almost always occurs, and may be followed by profuse and perhaps fatal hemorrhage.

Treatment.—This can consist only in laparotomy and the removal of the rudimentary horn, together with the product of conception.

Atresia of Vulva, Vagina or Cervix

An imperforate hymen now and then requires incision. A hymen apparently absolutely intact may yet contain a minute aperture through which the spermatozoa may penetrate.

Atresia of the vulva is very rare. It has been known to follow inflammation attending the exanthemata, and deep ulceration occurring in

the course of puerperal infection. It may also result from traumatism, and like similar conditions elsewhere may be of congenital origin.

Atresia of the vagina results from similar causes. Complete atresia is almost always congenital. Traumatism may be the result of an ill-fitting pessary, or of clumsy work with the forceps. Cicatricial bands may be either circular or longitudinal.

Atresia of the cervix in the form of simple agglutination of the external os or even absence of the os, is not a very formidable complication as we shall see directly. Marked atresia, however, involving the body of the cervix, and perhaps the internal os, is usually either congenital, or the result of traumatism attending difficult delivery.

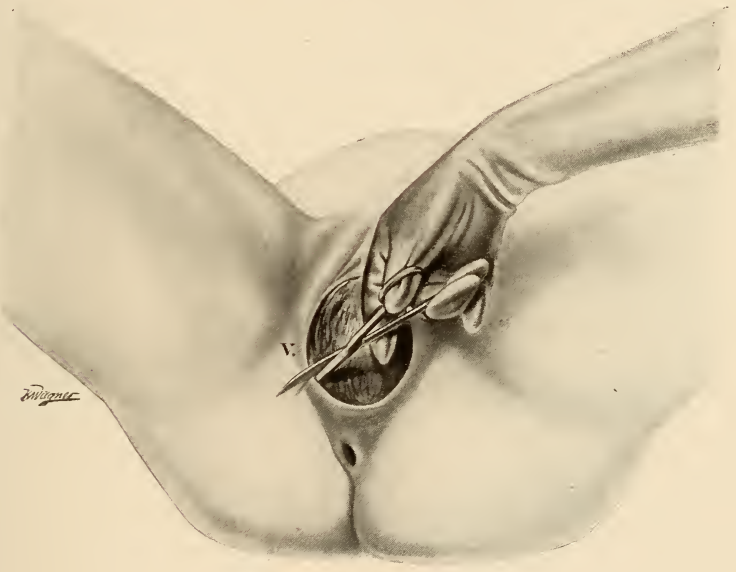

Fig. 172.—Episiotomy.

Treatment.—Stenosis or atresia of the vulva usually requires nothing more than a modified dilatation with the fingers or perhaps with a colpeurynter. Very rarely incisions may be necessary; a modified episiotomy (Fig. 172). An imperforate hymen is treated by incisions radiating from the centre.

Atresia of the vagina is treated in the same way. Circular constrictions may require multiple small incisions. If the obstruction is very marked it is better to perform Cæsarean section than to make deep incisions which may extend indefinitely during the process of delivery.

Mere agglutination of the external os is easily dealt with. A dimple usually marks the location, and the finger or some blunt pointed instrument is then introduced. Dilatation follows with surprising rapidity. If the

dimple is absent, a small crucial incision at the corresponding point suffices.

Stenosis and even congenital stricture of the cervix usually yield to the forces of nature. The idea that cicatricial tissue will not dilate does not apply to these cases. The congestion, softening and infiltration of pregnancy work wonders. Even when the cervix is a mass of cicatricial tissue it may dilate contrary to all expectation. If the obstruction is too great anterior vaginal hysterotomy may suffice, but if the child is of full size, or the patient a primipara, and if conditions are favorable, abdominal Cæsarean section is to be preferred.

So-called rigidity of the cervix is discussed where it belongs, *i.e.*, in connection with the subject of delayed labor. It is well to repeat here, however, that the cervix dilates most easily when the patient is at full term. This is also true, though in a lesser degree, of both the vagina and vulva.

Cystocele and rectocele, although made much of in the text-books, are of theoretical rather than practical interest in this connection. They can, in my experience, be pushed back without trouble. In the case of a cystocele the bladder must first be emptied by the catheter.

CHAPTER XIII

GENERAL DISORDERS OF THE MOTHER

PREËCLAMPTIC TOXÆMIA. ECLAMPSIA. THE VOMITING OF PREGNANCY. ACUTE YELLOW ATROPHY OF THE LIVER. CHOREA GRAVIDARUM

PATHOLOGICAL conditions affecting the mother during pregnancy fall naturally into two divisions: first, those which are caused by pregnancy and are, of course, peculiar to that condition, and second, those which have nothing to do with pregnancy *per se*, but occur simply as complications. Those which are inseparable from pregnancy are, of course, most distinctive and typical, and will be first considered.

During pregnancy the maternal organism must provide not only for ordinary physiological necessities, but for the upbuilding and development of the fœtus. New tissue must be constructed and waste products of fetal and placental metabolism must be disposed of. The mother must provide for the necessities of the fœtus. The latter has been aptly compared to a parasite, which takes what it needs, and leaves what it does not need, for the mother.

As a rule, the wonderful resources of nature are sufficient for the task. Not always, however. We need not wonder that the weaker parts of the organism sometimes break down; that many patients show the effect of the tax imposed by their extra burden. The anæmia and malnutrition so often observed in early pregnancy, even in the case of patients enjoying fairly good health, are only too characteristic.

Until we know more of the mysteries of organic life and development, we will not be able to tell just how or why the existence of pregnancy causes or favors the development of the morbid conditions which we are about to consider. Some of them are plausibly explained as toxæmias, other as neuroses, and so on. These explanations are often based upon assumptions or hypotheses that cannot be absolutely verified.

Nevertheless modern methods of classification, while still hypothetical and subject to revision, afford a better working basis than the old.

Most characteristic are the so-called toxæmias. These I am accustomed to divide into: 1. Preëclamptic toxæmia. 2. The vomiting of pregnancy. 3. Irregular and unclassified toxæmias.

Some writers speak of a nephritic toxæmia, but nephritis, like pneumonia and other diseases that may coexist with or complicate pregnancy, is a clinical entity in itself and has nothing to do with pregnancy *per se*.

Of the toxæmias of pregnancy the most frequent, and therefore from a clinical stand-point the most important, is preëclamptic toxæmia, commonly but less appropriately termed the toxæmia of pregnancy, or the kidney of pregnancy, or again, the albuminuria of pregnancy. The term kidney of

pregnancy is an unfortunate one because it tends to identify the condition with nephritis, and the same statement is true of the term albuminuria of pregnancy. The term toxæmia of pregnancy is preferable, since it does not attempt to define a condition the cause of which is not yet regarded as definitely settled, but there are other toxæmias that may occur during pregnancy. On the whole, the best term is preëclamptic toxæmia. This identifies the condition, even if it does not explain it, since we know that in the vast majority of cases, if not in all, it is the forerunner of eclampsia. Moreover, the use of this term serves to remind us of the vast importance of the timely recognition and treatment of the condition, as a means to the prevention of eclampsia, the most formidable complication with which the obstetrician has to deal.

The subject of preëclamptic toxæmia is one of the most important in the whole range of obstetrics. Most writers devote much space and time to eclampsia, and little to preëclamptic toxæmia. In my opinion this should be reversed. Eclampsia, in most cases at least, is easily prevented. In the present state of our knowledge it is not easily cured. Here, as so often elsewhere in obstetrics, prophylaxis is of prime importance. Every obstetrician who appreciates the responsibility of his calling should familiarize himself with the symptoms of this condition, should search for them in every case, and, having found them, should lose no time in the institution of suitable measures of relief. What are these symptoms?

Clinical History.—The condition is distinctively one of the latter months of pregnancy. Its symptoms soon become familiar to every observant practitioner. Similar symptoms occurring early in pregnancy usually indicate nephritis, which is to be sharply differentiated from preëclamptic toxæmia.

They are best considered under four heads: 1. Those referred to the urinary secretion. 2. Those referred to the circulatory system. 3. Those referred to the nervous system. 4. Those referred to the digestive system.

True, this classification of symptoms is empirical rather than scientific. For example, the nausea probably has nothing to do with the stomach, *per se,* but is of toxic origin, the headache is of toxic rather than nervous origin, etc., but in my experience it affords an excellent method of refreshing the memory in going over a case clinically.

The most definite and characteristic symptoms are those which are shown by urinalysis and of these albuminuria comes first. The presence of albumen during pregnancy, even though the amount be slight, should always excite the keen attention of the physician. And this especially if the albuminuria is constant, *i.e.,* if it is found at repeated examinations.

Writers of the last generation were wont to say that a slight albuminuria is normally present in most pregnancies and is to be regarded as a harmless phenomenon. It is true that we occasionally see a transient or intermittent albuminuria that is unaccompanied by symptoms. A transient albuminuria may occur after a hearty meal, or after some unusual exertion, just as

it may in the non-pregnant condition, and, indeed, just as it usually does immediately after labor. Perhaps it is a little more common in pregnancy, though this has not been my observation.

Bumm and other German writers attribute the occasional slight intermittent albuminuria, which is also unattended by symptoms, to a catarrhal inflammation of the bladder, which, they state, is quite common during pregnancy. Strictly speaking the condition is one of congestion rather than inflammation, and the albuminuria is due to transudation through the congested mucous membrane of the bladder. Then again, it may be due to the contamination of the specimen by some vaginal discharge.

Personally, I believe that the frequency of these causal factors is often exaggerated. Many times the accompanying toxæmia is overlooked because the patient seems in fair health and it is taken for granted that no serious trouble can be impending. If a careful examination were always made in these cases of slight albuminuria some traces of toxæmia, *e.g.*, a rise in the blood pressure, or a little œdema of the ankles, would usually be found.

It is safest to regard every case of albuminuria occurring in the latter half of pregnancy as one of toxæmia, and to treat it as such, unless the presence of the albumen can be definitely accounted for in some other way. In doubtful cases the urine should be drawn with a catheter, after careful cleansing of the parts.

In the mild cases there is no great amount of kidney débris, though a few hyaline casts may be present.

Now and then the physician is called to a case in which the urine is decreased in quantity and contains large quantities of albumen, together with granular and epithelial casts, but in these cases the other clinical evidences of toxæmia are too plain to be overlooked.

Some years ago certain enthusiastic writers startled the medical world by the assertion that a low urea output is a precursor of eclampsia and the most significant symptom of the preëclamptic toxæmia. How many labors were unnecessarily induced as a result of the rash acceptance of this dictum will never be known. Personally, I soon became satisfied that such teaching was incorrect. Examining the urine of outpatients at the New York Polyclinic I found that the urea output might be astonishingly low in cases that were to all appearances absolutely normal. Many other observers reached the same conclusion, while still others pointed out that the excretion of urea is no index of the patient's condition, unless the amount of nitrogenous food consumed is also definitely ascertained. Moreover, it was soon found that, for some as yet unexplained reason, pregnant women excrete less urea than those who are not pregnant.

More recently, various investigators have claimed that a better index to the prognosis is found by a study of the now familiar "nitrogen partition," *i.e.*, by the relative amounts of nitrogen eliminated as ammonia and as urea. There is good authority for the statement that in grave toxæmia, not only is the total percentage of urea much decreased, but that the relative

amount of nitrogen excreted as ammonia is relatively increased. This kind of analysis, however, requires two or three days for its completion, and is quite beyond the resources of any one who is not a good analytical chemist. Moreover, it is expensive and there are many sources of error.

Soudern believes that acidosis precedes the other urinary changes in toxæmia and his statement certainly corresponds with what we know of nitrogenous metabolism in these cases. Unfortunately this acidosis is usually overlooked.

But we should not be satisfied with the chemical analysis of the urine. The quantity should always be noted. So great is the inertia of custom and habit that one often sees cases in which the attendant has contented himself with simply testing the urine for albumen without asking as to the quantity. During the latter part of pregnancy the patient should be questioned upon this subject from time to time even if no evidences of toxæmia have been observed, and in all cases of doubt the urine should be carefully measured. A pregnant woman, taking a normal amount of liquids, should pass not less than sixty ounces per day, and any considerable fall below this amount should be made the subject of investigation.

For the general practitioner then, far removed from laboratories, and working, often to his great credit, among the poor, the determination of the presence and the approximate amount of albumen, the presence and variety of casts, and the measurement of the total quantity of the urine, will remain the chief available means of diagnosis, so far as the urine is concerned. Fortunately these, if combined with a careful consideration of the clinical symptoms, are usually quite sufficient.

Symptoms referred to the circulatory system are usually the first to be observed. Among these symptoms the œdema is the most prominent and distinctive. Some slight swelling of the feet is common enough in the latter months of pregnancy, especially in multiparæ. It is especially noticeable when the patient has been on her feet during the day and is often associated with varicose veins. When, however, it is at all noticeable, or when it occurs in a primipara, or if it is present when the patient arises in the morning, it is to be regarded with suspicion. It is a safe rule to regard every case of œdema of the feet as a possible toxæmia and to institute a careful urinalysis. When the swelling extends up the leg and there is pitting on pressure over the tibia, marked evidences of toxæmia will usually be found. Œdema of the upper part of the body, and particularly of the hands or face, is a dangerous symptom. Puffiness under the eyes is highly significant, as is also swelling of the hands. Now and then the patient will complain that she has trouble in getting her rings on or off. Marked œdema of the labia and general œdema are evidences of profound toxæmia.

A pulse of high tension and a blood pressure of 140 or more are highly suggestive symptoms if present, but I have not found their presence as uniform as is commonly supposed.

Symptoms Referred to the Nervous System.—Among these, headache is especially prominent. It is often described as being located above and behind the eyes. When continuous and severe, it is of bad omen, perhaps portending an eclamptic attack. Other symptoms are nervousness, irritability, insomnia, twitching, vertigo, and ocular disturbances. The latter are of special significance. The patient may complain of trouble in reading or sewing, or of specks, or bright spots, before the eyes, or even that she cannot see at all.

Symptoms Referred to the Digestive System.—These symptoms are usually less prominent, but should on no account be forgotten. Nausea and vomiting are so common in early pregnancy as to attract little attention unless excessive. Occurring in the latter months, however, they are often toxic in origin. The same thing is true of unusual or obstinate constipation. Any kind of epigastric or abdominal pain not connected with uterine contractions, is to be regarded with suspicion. The cause of this pain is not clear. It may be most intense, reminding one of the gastric crises of locomotor ataxia. I recall a case in which epigastric pain so severe as to require a full dose of morphine hypodermatically, for its relief, was the immediate forerunner of an eclamptic attack. After the patient's recovery she had no more recollection of the pain and of the hypodermatic injection than of the convulsions which followed.

In neglected or untreated cases and, very rarely, in spite of treatment, things go on from bad to worse. The amount of albumen increases, and epithelial and granular casts appear in abundance. Œdema of the face, shown especially by puffiness under the eyes, may be present. Severe and persistent headache is common at this time, and the patient may partially or even completely lose her vision. Vomiting and epigastric pain are characteristic. Contraction of the pupils is an ominous sign.

These phenomena, or a majority of them, taken together, constitute the preëclamptic syndrome of the older writers. The picture is seldom seen nowadays, at all events, by those who practise modern methods.

Such in brief are the symptoms of preëclamptic toxæmia. With these symptoms the practitioner should become familiar early in his career. And he should never forget to seek for them *even though the patient makes no complaint.* Not all these symptoms are present in every case, nor are they always pronounced; but to wait until the clinical picture is unmistakable, before instituting treatment, may be to wait too long.

What are the etiology and essential nature of this so-called toxæmia of pregnancy? Many theories have been advanced. Not one has been generally accepted. It is assumed that the condition is a toxæmia, but the nature of the toxin or toxins is not generally understood. The condition is the forerunner of eclampsia, and the etiology of the two will be considered together.

Diagnosis.—This is usually easy. Most mistakes are due to carelessness rather than to lack of skill. The examiner should catalogue the symp-

toms in his mind, and go over them one by one. Occasionally one meets hysterical amblyopia in pregnant women, and œdema may be due to varicose veins, but in either case the urinalysis will settle the question. Albuminuria may be due to a vaginal discharge, but if the urine is drawn with the catheter and filtered all doubt is removed.

It is more difficult to differentiate the condition from nephritis, since in the latter there may be both œdema and albuminuria. Nephritis, however, occurring at this time, is usually the continuation of a process antedating pregnancy, and the symptoms are marked during the early months; while preëclamptic toxæmia is distinctively an affection of the latter half of pregnancy, usually of the last two or three months, and often occurs in strong and vigorous young women, who have no history of nephritis or other serious illness. Uræmic dyspnœa may be marked in nephritis, while the dyspnœa of toxæmia is subjective in character, and is hardly noticed, even by the patient herself.

Of course, an acute nephritis may occur during the latter part of pregnancy, but this is certainly very rare. In the absence of any history it might be impossible to distinguish the coma or convulsions of uræmia from those of eclampsia.

The urinary findings may be of service. In preëclamptic toxæmia the quantity of urine is usually diminished, while this is not necessarily the case in nephritis. In the latter condition all kinds of casts may be found, whereas in toxæmia there are few casts except in severe cases verging on eclampsia. Finally in nephritis we do not have the high ammonia coefficient that characterizes preëclamptic toxæmia.

Treatment.—The first manifestations of toxæmia should be the signal for the institution of treatment. The earlier treatment is begun, the better the chances of success. I am accustomed to summarize the various steps of the treatment as follows: rest, diet, medication, hydrotherapeusis, fresh air, and oxygen.

A patient showing symptoms of toxæmia should be put to bed. This is the first, and often the most important, part of the treatment. A post-scarlatinal albuminuria in a child is always regarded with apprehension, and made the subject of careful treatment. And yet, how often one finds a pregnant woman with albuminuria and swollen ankles doing her own housework, and burdened with all kinds of domestic cares.

It is perfectly plain that when nature is trying to rid the system of some poison, she can accomplish her work better if other demands upon her resources are minimized. Moreover, this theoretical conclusion is confirmed by clinical experience. It is a matter of every-day experience that these patients usually improve rapidly if kept in bed for a time. If the patient cannot or will not do this she should be advised to refrain from work and worry as far as possible, to retire early, and to lie down for two or three hours every day.

The patient should be put upon a milk diet. Milk is a sufficient nutri-

ment and at the same time an excellent diuretic. Other articles of diet, especially red meats, should be proscribed, but it is not necessary to become fanatical upon this subject. An occasional cracker, or a stalk of celery, serves to encourage the patient, promotes the flow of saliva, and does no harm. Patients are sometimes sickened and disgusted by an exclusive milk diet, and it is therefore wise to vary the taste and composition of the milk as much as possible, after the manner of the French physicians. Thus it may be given, sometimes hot, sometimes cold, again diluted with water, lime water, or vichy, or flavored with some innocent aromatic, etc. The patient should be instructed to drink large quantities of water, or, if she prefers, of some alkaline mineral water. This diet should be continued until there is a decided improvement, and the resumption of the usual diet should be gradual and provisional. Some care should be observed in this respect during the remainder of her pregnancy.

In many cases rest in bed and a milk diet would doubtless be sufficient; but there are other methods of proved efficiency, and caution dictates their employment in every instance.

Elimination.—Saline cathartics should be administered in quantity sufficient to produce one or two watery movements a day, for several days. For this purpose Epsom or Rochelle salts may be used. For susceptible patients the citrate of magnesia is sufficient and has the advantage of palatability. Among the diuretics Basham's mixture enjoys a good reputation and the iron which it contains is useful, since these patients soon become anæmic. In urgent cases with considerable œdema, the infusion of digitalis, or diuretin, is to be preferred. Pilocarpine, sometimes advised for the purpose of furthering excretion by the skin, is dangerous and has been known to cause pulmonary œdema and death. The hot pack answers the same purpose.

Elimination by the skin should be encouraged. A daily sponge bath is advisable, and if the symptoms are threatening the hot pack often brings improvement. Not to be forgotten at this time is free colonic irrigation with hot salt solution, usually, but for no reason, reserved until the outbreak of convulsions.

Let me anticipate for a moment the question of etiology.

Various observers have endeavored to find the toxin in some imperfectly oxidized body, *e.g.,* lactic acid, but these efforts have been barren of results. So many skilled observers in all parts of the world have been working in this field that it seems difficult to believe that any specific poison could have escaped observation.

May it not be that we have been looking too far for the cause of the symptom-complex, which we call the toxæmia of pregnancy, but which should be called the preëclamptic condition? In other words, may not suboxidation itself be the real cause, or, at all events, a prominent factor? In pregnancy a woman needs oxygen more than at any other time. The clinical symptoms, from the subjective dyspnœa, so common in pregnancy

approximately normal, to the headache, œdema, and final convulsions of profound toxæmia, are strongly suggestive of lack of oxygen. This theory helps to explain why eclampsia occurs so often in robust and vigorous young women. These patients have a high oxidative equilibrium and are the first to suffer from oxygen deficiency.

Acting upon this theory, I have for more than two years treated all my toxæmic cases by the free use of oxygen inhalations in addition to the usual treatment. All these cases have done well, and none of them have gone on to the development of convulsions. Most of them have been hospital cases, and I have been able to watch them carefully and to supervise the details of the treatment. Many of them were well-marked cases, and several suffered from profound toxæmia.

It is a well-known fact that pregnant women are badly affected by the air of crowded places, and ill-ventilated rooms, and every observant physician has noted the relief afforded by fresh air and the open window. There is a valuable lesson here. Many patients cannot procure oxygen, but there are few indeed who cannot get fresh air. In the treatment of toxæmia, and, for that matter, in all cases of pregnancy, careful attention should be paid to ventilation. An abundance of fresh air, both by day and night, is an important element in the treatment, and when the weather permits it is wise for the patient to recline upon a couch or hammock out of doors. I am convinced that what I have ventured to call the fresh air treatment of pregnancy in general, and of toxæmia in particular, will some day be generally recognized as is now the fresh air treatment of tuberculosis.

With the exception of the oxygen, and the fresh air treatment, the measures here described are not new; but they are none the less effectual. As a rule bad results are not due to the inadequacy of the treatment, but to the fact that it is applied too late. *There are few conditions in which the resources of medicine are better exemplified than in the prompt and thorough treatment of preëclamptic toxæmia.*

In the few cases in which treatment is not successful, in which the albumen increases, and the total amount of urine diminishes, it is best to induce labor. True, there are cases which in spite of unfavorable symptoms terminate favorably, but such cases are exceptional, and such a termination cannot be predicted.

It is a consolation to remember that in these cases the child is usually viable and that the induction of labor is not always to its disadvantage. It has been abundantly demonstrated that the toxæmia injures the fœtus as well as the mother.

Puerperal Eclampsia

The term eclampsia from the Greek ἐκλάμπειν, to flash, really means a convulsion and nothing more, but it has come to be applied to a condition characterized by convulsions and coma, and preceded by the symptoms of preëclamptic toxæmia already described. It is, indeed, the natural

culmination of this toxæmia when untreated, or unaffected by treatment. The name is purely empirical and tells nothing of the essential nature of the condition, but aptly indicates the sudden nature of the attack. Eclampsia does, indeed, come like a flash to him who is unprepared.

Etiology.—It seems clear that the causes of preëclamptic toxæmia and of eclampsia are the same. When the causal agent in toxæmia, whatever it may be, is allowed free play, when its pernicious activity is not arrested either by treatment or by the efforts of nature, the result is eclampsia. The immediate cause of the convulsions does not enter into the question—at least not directly. Convulsions occur in many diseases of widely different origin. The question to be answered here is, What is the cause of the condition which gives rise to the convulsions? It is the fashion now to call the condition a toxæmia—to assume that it is a certain toxin circulating in the maternal blood that causes the symptoms of preëclamptic toxæmia, and eventually the coma and convulsions of eclampsia. But what is this toxin? This is still *questio vexata*. Formerly it was thought to be uræmia, and the cause of the uræmia was thought to be a nephritis complicating pregnancy. The study of the pathology of the disease, however, which shows that the kidney changes are secondary rather than primary, and that the changes in the liver are more marked than those in the kidney, together with the differences in the clinical history of the two conditions, has proved the falsity of this theory. It is astonishing, however, to see how strong a hold the idea still has upon the popular, and even the professional, mind.

The theory of auto-intoxication first advanced by Bouchard was popular for a long time. According to this the cause of eclampsia is to be found in the inability of the kidneys to perform their task in the elimination of the excess of waste matter that must be disposed of during pregnancy. This he sought to prove by showing that the urine and blood serum of eclamptics, injected into animals, are more poisonous than normal urine and blood serum. Various observers disprove this theory by showing that the toxic properties of these fluids are due to their concentration, and that, when diluted up to the normal stand-point, they have no toxic action.

The auto-intoxication theory, in one form or another, has always been popular in France, and Fabre and others now hold strongly to the belief that the absorption of decomposition products from the intestinal tract is the real cause of eclampsia.

The modern "biological" theories and hypotheses have recently been much invoked in efforts to discover the cause of eclampsia, and of these theories Veit has been the most prominent exponent. It is well known that during pregnancy the blood is invaded by certain fetal elements, *e.g.*, the syncytial elements of the placenta, which but for the development of a hypothetical antibody would do harm if present in excess, and that in eclampsia this antibody is not present. Somewhat analogous theories have been advanced by Ascoli, Weichardt, and Hofbauer, and contradicted by

Frank, Heimann, and Lichtenstein. It is plain, even to the uninitiated, that these theories rest upon unverified assumptions.

Schmorl and Dienst, noting the frequency of multiple thromboses in eclampsia, ascribed their presence to the invasion of the blood current by an excess of fibrin ferment. Dienst went a step further and attempted to explain why the fibrin ferment is increased. There is, he says, an antithrombin which should normally neutralize any excess of coagulating material. This antithrombin is produced in the liver, but during pregnancy this organ may become unequal to the task.

Thyroid insufficiency has been held by Lange, Nicholson, and others to be the cause, but no very positive evidence to this effect seems to have been supplied. It is probable that if thyroid extract does good in these cases it must be by its well-known effect in stimulating general metabolism and indirectly oxidation.

Eclampsia has also been attributed to bacterial infection, but the offending organism has not yet been found. Certain writers, of whom Sellheim was the first, have believed it to be due to the action of some toxin of mammary origin, and it has recently been suggested that it is an anaphylactic phenomenon. Many other theories have been advanced and for the most part quickly discarded. To discuss them all here would carry us far beyond our limits.

On the whole it seems plain that the cause must be bound up with the presence *in utero* of the living and growing fœtus. The fœtus may die as the result of the eclamptic poison or poisons, but seldom or never does a mother carrying a dead fœtus develop eclampsia. Moreover, it is plain that the fœtus must have reached an advanced stage of development, since eclampsia is essentially a disease of the latter months of pregnancy.

Perhaps the most significant and encouraging studies that have recently been made have been those of Zweifel, Williams, Stone, Ewing and others, in connection with nitrogenous metabolism in pregnancy; studies that have shown conclusively that during pregnancy large quantities of nitrogenous substances are excreted by the kidneys in a state of incomplete oxidation. It is assumed that this incomplete oxidation must be the result of some toxin of unknown origin circulating in the maternal blood and interfering with the oxidative function in the liver, or the eliminative work of the kidneys, or both.

It seems to me that while the main facts in the above premises are true, the conclusion does not necessarily follow. Why need we assume the existence of some special toxin? May it not be that suboxidation itself is the real cause, or at all events a prominent factor? In pregnancy a woman needs oxygen more than at any other time. Without this excess supply she cannot hope to meet the relatively enormous demands of fetal and placental metabolism. Moreover, in the latter part of pregnancy her oxygen supply is limited, owing to the diminished abdominal space and the consequently limited excursions of the diaphragm. This is, of course, especially true in

cases of extreme distention, *e.g.*, in hydramnion and in twin pregnancy, and it has long been a matter of common knowledge that both these conditions predispose to eclampsia.

Zweifel has suggested that lactic acid, which has been found in the blood and cerebrospinal fluid of eclamptics by himself and his pupils, may prove to be a cause. To my mind it is a result rather than a cause. It is found in the urine of those who die of asphyxia. It is a symptom of suboxidation. The recent researches of Thomas Lewis show that in dyspnœa following exertion lactic acid is present in the blood as a result of the increase of its carbon dioxide content.

The clinical symptoms of the toxæmia of pregnancy, from the subjective dyspnœa so common in pregnancy approximately normal, to the headache, œdema and final convulsions, are strongly suggestive of lack of oxygen. No other hypothesis helps to explain the seemingly inexplicable but undoubted fact that eclampsia usually occurs in robust and vigorous young women. These patients, as before stated, have a high oxidative equilibrium and are the first to suffer from oxygen deficiency.

Pathology.—The pathological changes are most marked in the liver. Indeed, it is not too much to say that these are the only definite and characteristic changes. Schmorl, who has made the pathology of eclampsia his special field, declares that the diagnosis can be positively made out by the hepatic changes. Scattered throughout the organ are found areas of anæmic and hemorrhagic necrosis resulting apparently from thrombosis of the smaller portal vessels. According to Williams the necrotic processes in the eclamptic liver are to be sharply differentiated from those of the vomiting of pregnancy by the fact that they result from the extension of a thrombotic process and involve chiefly the periphery of the lobules, while in the vomiting of pregnancy the necrosis begins in the centre of the lobules.

Some kidney changes are almost always to be found, but they are very variable. Their chief characteristic is, as Bumm aptly phrases it, that they are degenerative rather than inflammatory. In some cases, very few in number, there is little or no demonstrable change; in others there is simply congestion, while in what is perhaps the majority of cases there are cloudy swelling and fatty degeneration of the epithelium. These changes are likely to be mistaken by superficial observers for true parenchymatous nephritis, but careful study shows that in eclampsia the changes are secondary, rather than primary, and this is in harmony with the clinical history of the condition.

Multiple thrombosis is the principal feature of the cerebral changes. Occasionally the vessel may rupture, with resulting apoplexy and eventual softening. Sometimes the brain is congested, at other times pale, anæmic and œdematous. Doubtless these varying appearances correspond to different stages of the condition. A patient may die, for example, during a convulsion or at the height of an attack, with high temperature and

cerebral congestion; more commonly, however, after gradual failure of cardiac action, with weak and irregular pulse and pulmonary œdema.

Period of Pregnancy.—Like the toxæmia of pregnancy, eclampsia is essentially a disease of the latter months of the child-bearing process, including in this term labor and the puerperium. It has been noted in the sixth and seventh months of pregnancy, but this is uncommon. About half the cases occur during labor, though doubtless this labor is in many cases premature, having been brought on by the profound toxæmia. Perhaps one-half of the remaining cases are observed during the eighth and ninth months of pregnancy, before the beginning of labor, and the other half during the postpartum period. Cases reported as occurring during the first half of pregnancy are probably to be regarded as cases of nephritis, a different clinical and pathological entity.

Frequency.—This has been variously estimated. Perhaps one in five hundred would be approximately correct in cases seen outside of hospitals. In hospitals it is considerably more common, doubtless because eclamptics are brought to the hospital for treatment. It is more common in primiparæ, and its greater frequency in twin pregnancy is well established. It is said to be more common in cases of hydramnion, but this, I believe, is doubtful. Many observers have claimed that it is more common in cold climates and in damp weather. Judging from the reports of many of my students at the New York Polyclinic, it is more common in remote and sparsely settled regions than in cities or suburban localities. I have more than once been surprised at the practical familiarity of these men with the condition, due, no doubt, as one of them explained, to the fact that they are seldom called until the patient is in labor and therefore have no opportunities for instituting prophylactic treatment. In New York I often meet general practitioners of considerable experience who have never seen a case.

Clinical History and Diagnosis.—The usual if not the constant prodromata are those which we have already discussed as the symptoms of the preëclamptic condition. The most characteristic are severe and constant headache, visual disturbances, œdema of the face, and pain in the epigastrium. The latter symptom occurring in a toxæmic case is highly significant and is often followed in a few hours by the outbreak of convulsions.

Williams and others believe that, in rare instances, eclampsia may develop without prodromata of any kind, even without albuminuria. There seems to have been no room for error in his cases since they were under constant observation in a hospital. While not denying the possibility of such an occurrence I believe it to be extremely rare, as no such case has fallen under my observation. Pinard, in an enormous experience, saw but one case.

Clinical History.—Its onset is dramatic and terrifying. The patient, who has perhaps just been conversing intelligently with her physician or nurse, is suddenly seized with a convulsion. If the physician happens to

be watching his patient, the first thing noticed is that the eyes become fixed in an uncanny and unmeaning stare not pleasant to look upon. Then comes slight twitching of the face and eyelids, followed by spasm of the facial muscles and those of the upper part of the body, rolling of the eyes, and protrusion of the tongue.

Now the scene changes. The second stage of the convulsion begins. The entire muscular system becomes fixed in immovable contractures. The thorax becomes immobilized, the breathing is arrested, the face is blue and cyanotic, to the uninitiated death seems at hand. Fortunately this stage, which seems endless to the onlooker, really lasts but ten or fifteen seconds. It ends suddenly with a deep inspiration which ushers in the third stage. Tonic and clonic convulsions of the whole body now follow. As a rule, however, the upper part of the body is most affected. In some cases the movements are so rapid and violent that the patient can hardly be kept in bed. The breathing is irregular and stertorous, the pupils widely dilated, and from the parted lips issues foam, and blood from the bitten tongue. The temperature may reach 102° or 103° during the convulsions. In mild cases it falls after the convulsion is over. In severe cases it remains high during the intervals, in bad cases 103° or 104°.

The cause of the high temperature in eclampsia has been the subject of controversy, having been variously regarded as toxic, thermal, or septic in origin. I am inclined to regard it as thermal since it occurs in many cases in which the clinical and bacteriological evidences of sepsis are absent, and in which there have been no internal manipulations. Of course, sepsis may occur in eclamptic cases, as in other cases. Some writers believe, indeed, that eclampsia predisposes, but I have not been able to convince myself that it occurs oftener than in other cases, if we allow for the fact that operative interference is so often practised.

The pulse is rapid and of high tension, but strong and regular, and often reaches 130 or 140. It is best studied after the convulsion is over, for during the convulsion it is often intermittent, feeble, or even imperceptible. Doubtless this is due to the compression of the vessels by spasmodic muscular contraction. Any one who will carefully study a typical eclamptic convulsion will easily recognize the three stages which I have described. The stage of invasion, the stage of contracture, and the stage of convulsions. The division, of course, is that of the French writers, who have studied the clinical phenomena of eclampsia with unrivalled accuracy and precision.

In mild cases the patient regains consciousness soon after the convulsion, but remembers nothing of what has transpired. In severe cases she passes into a condition of profound coma as the convulsions recur. The entire convulsion does not usually last more than one minute, though, of course, it seems longer. As the first convulsion subsides the patient will be found in a semicomatose condition, and may not fully regain consciousness until some hours later, when she will be quite unaware that

anything unusual has transpired. In the more severe cases she passes into a condition of profound coma and lies like one in an apoplectic stupor. The breathing is stertorous, the pupils, which during the convulsion were widely dilated, have become contracted, and the pulse is again strong, regular, rapid, and of high tension. At intervals the convulsions recur; though in some cases there may be but one or two. This is especially apt to be the case in the postpartum variety. As many as one hundred or more have been reported. The intervals may vary from a few minutes to a few hours.

The catheter brings but a few drachms, or even a few drops, of urine which becomes solid upon boiling.

In a case of moderate gravity there may be ten or fifteen convulsions, the patient emerging gradually from her comatose condition, and the urine increasing in quantity, the pulse meanwhile remaining regular and strong, though still rapid. In the severe types the coma becomes profound, the temperature remains high, and jaundice is often marked. Most significant of all, the pulse becomes weak and irregular and there is beginning pulmonary œdema. As a rule, death is not long in following. Sometimes the pulse is compressible from the beginning, a most unfavorable symptom.

Mental disturbance following eclampsia is not uncommon.

Prognosis.—Eclampsia is always a serious condition. The maternal mortality is from 20 to 30 per cent., and the fetal mortality, 50 per cent. or more. Postpartum cases are, in my experience, much less fatal than those that occur before or during labor. Cases in which the cervix is dilated or easily dilatable offer a more favorable prognosis than those, fortunately rare, in which the cervix is rigid, and the canal persists in its entire length. Such cases, for example, as one meets occasionally in primiparæ in the fifth and sixth month. These cases are unfavorable because the attendant is obliged to choose between leaving his patient undelivered and adding the shock of a difficult operation to the burden which she already has to bear. Thus we see that the earlier the attack occurs the greater the danger.

In my experience the most significant index of prognosis is the pulse. Profound coma and repeated convulsions are, of course, unfavorable, but they are by no means hopeless. If the pulse remains strong and regular, even though it be 130 or 140, as it often is, and of high tension, there is a fair chance for recovery. When the pulse becomes weak and irregular the prognosis is very bad. Sometimes the pulse is soft and compressible from the start, a most unfavorable symptom. Marked jaundice and a persistent high temperature are bad signs. According to Polak a normal or subnormal leucocyte count is a fatal prognostic, while a high count if persistent is favorable. Complete anuria is, of course, one of the worst symptoms, whereas a gradual increase in the amount of urine is most encouraging.

Diagnosis.—There can hardly be difficulty in the diagnosis of

eclampsia. In my experience the malady which is most likely to simulate eclampsia is hysteria. According to my observation this occurs most often in illegitimate pregnancy. I can recall three cases, all in hospital practice, in which hysterical coma in advanced pregnancy presented a picture somewhat like that of eclampsia. These patients may even have convulsions, though in this country hysterical convulsions are rare. Here we depend upon the results of urinalysis, since it is a well-known fact that hysterical women secrete large quantities of clear urine of low specific gravity.

Uræmic poisoning may be mistaken for eclamptic coma and the differentiation may be for the time impossible unless an accurate clinical history can be secured. Such a history would show evidence of a preceding nephritis, *e.g.,* dyspnœa, œdema, and albuminuria, in early pregnancy or before pregnancy began.

Eclampsia has been confused with strychnine poisoning, and epilepsy, but in both cases the history and the results of urinalysis should be sufficient. The remarkable resemblance of eclampsia to acute yellow atrophy of the liver, and of phosphorus poisoning to both, is discussed in connection with acute yellow atrophy.

Finally acute bichloride poisoning from intra-uterine injection of bichloride solutions has now and then been diagnosed as eclampsia.

Preventive Treatment.—The preventive treatment is by all odds the most important. It is far easier to prevent eclampsia than to cure it. If the practitioner will regard every case as one of possible toxæmia, watching carefully for the first danger signal, and treating it promptly by the methods already described, he will seldom be called upon to undertake the solution of this, the most difficult problem in obstetrics. Doubtless he will, in this way, give himself much unnecessary trouble, but he will be repaid in the end, if only by the satisfaction of a clear conscience. Let me appeal also to a lower motive. The general public has already learned that to omit urinalysis during pregnancy is to do grave injustice to the patient. It will not do to become careless because many cases do well though utterly neglected. Such an attitude is sure sooner or later to give ground for bitter remorse. Nor is it safe to presume upon the fact that one's patient is apparently strong and vigorous; for it is in just this class of cases that the dread disease oftenest develops.

Another caution—it is the height of folly to wait for the appearance of symptoms that attract the serious attention of the patient and lead her to consult her physician. What some women will endure without complaint is often a matter of wonder to the medical adviser. Moreover, some of the most ominous symptoms of toxæmia, *e.g.,* œdema of the face, suppression of urine, are neither painful, nor particularly troublesome. The physician should see his patient every week or two during the latter months of pregnancy and satisfy himself as to her condition by ocular inspection and by judicious questioning as well as by urinalysis.

Treatment.—It seems to me that reason and experience combine to

show that the chances of the eclamptic patient are improved by the emptying of the uterus, provided this can be done without profound shock or grave injury. This removes the fœtus and placenta, which are at once the source, or in some way the cause, of the toxæmia, and by their presence the reflex excitant of convulsions. I am strengthened in my belief by the fact that postpartum eclampsia runs a much milder course than eclampsia that begins before or during labor. An incidental benefit, perhaps, is the loss of blood that accompanies the process of delivery.

I therefore advise that if the physician finds his patient in labor he hasten the process as much as is consistent with the interests of the mother. For example, if she has reached the second stage the forceps should be applied and delivery accomplished. If she is still in the first stage, and if the cervical canal is obliterated and the cervix easily dilatable or perhaps partly dilated, manual dilatation should be employed and delivery accomplished by version or forceps, according to indications. In spite of his anxiety the operator should work carefully and deliberately, and in particular should he strive to avoid bad tears of the cervix and lower uterine segment by observing the rules laid down in the section on obstetric surgery. Bad tears of this kind, caused by an insane desire to complete delivery in a few moments at any cost, have sometimes been responsible for mournful results.

Whenever delivery *per vias naturales* is contemplated it is well to begin by rupturing the membranes. This procedure, by reducing the abdominal tension, diminishes reflex irritation, undoubtedly a factor in causing the convulsions, and perhaps allows a better pelvic circulation, thus favoring elimination.

The anæsthetic used should be ether oxygen and the admixture of oxygen should be plentiful. It has been clearly shown by various European investigators, and by Cragin and Hull in our own country, that chloroform produces lesions of the liver and kidneys similar to those in preëclamptic toxæmia and eclampsia. I have long believed that the free use of chloroform in eclampsia increases the tendency to death.

Even if labor has not begun, if the patient is near term, it may be possible to pass a finger through the cervix and introduce a Voorhees bag, going on with the induction of labor according to the rules already given, and the short delay involved is far better than an immediate resort to some heroic procedure.

But suppose that the cervix is found quite unprepared for parturition, long and hard, the canal preserved in its entire length, the patient in all probability some months from term. Such a case cannot be safely treated by manual dilatation. Even dilatation with bags is here a long and tedious procedure, requiring repeated anæsthesias and manipulations, and perhaps not successful in the end. The situation is a serious one. What is to be done?

If the patient can be transported to a well-equipped hospital and placed

in the hands of a thoroughly competent operator the best results will probably be secured by delivery by means of the vaginal or abdominal Cæsarean section, according to the circumstances of the case. If the patient is a multipara and the child not over-large, the vaginal operation is the operation of choice, but if she be a primipara with a narrow vagina and perhaps a large fœtus, the abdominal operation is, in my opinion, much to be preferred.

On the other hand, if the operator is inexperienced or the surroundings unfavorable, it is better to rupture the membranes and treat the case medically by the methods which will be presently described. The rupture of the membranes is in itself a measure of relief, and labor usually follows within a day or two. Meanwhile it may be possible to control the convulsions by appropriate treatment.

Cases, however, in which the necessity for this choice may arise are very rare. Eclampsia usually develops during the latter weeks of pregnancy and the examiner almost always finds obliteration of the cervical canal and beginning dilatation of the external os. It is to be feared that those whose experience has been limited to surgery or pure gynæcology have now and then been led to perform the Cæsarean section upon insufficient indications.

I have discussed the obstetrical treatment of eclampsia first, because it is usually the most important, but the medical treatment is not to be forgotten. In some cases, *e.g.*, in the postpartum cases, and in the cases in which, for some good reason, delivery cannot at once be undertaken, it is our only resource; and in all cases it forms if not the principal part of the treatment at least a very important part of it.

As is usually the case in most conditions, the etiology of which is not known, many remedial measures have been tried and discarded. It would serve no useful purpose to recount them all.

There are three indications which it is well to bear in mind:

1. The suppression of the convulsions and the promotion of muscular relaxation.
2. The promotion of elimination.
3. The reduction of the blood pressure.

It is, of course, perfectly true that the convulsions do not in themselves constitute the disease which we call eclampsia, but no one who has watched these convulsions can doubt that they are in themselves a source of danger. It was formerly the custom to treat the convulsions by the intermittent administration of chloroform continued over long periods. This is now generally recognized to be bad practice. As already noted ether oxygen is safer in these cases. But it is highly undesirable that the patient should receive more of any anæsthetic than is absolutely necessary. For the purpose of suppressing the convulsions ether should be used only as a temporary measure and should be supplanted as soon as possible by some other agent. Of these agents the best in my opinion is morphine hypo-

dermatically. It should be administered early in the attack while the patient still has a strong and regular pulse, and before the access of profound coma. With threatening heart failure, as shown by a weak and irregular pulse, and perhaps by beginning pulmonary œdema, it is, of course, a dangerous drug, and would only hasten the fatal end; but this does not speak against its rational employment.

I am in the habit of beginning with ¼ gr. to ½ gr., repeating the smaller dose, according to circumstances, sufficiently often to keep the patient in a quiet sleep for some hours. Personally morphine has seemed to me to do good and many of my students at the New York Polyclinic from all parts of the country, who have taken up this method on their own initiative, and without text-book or other encouragement, as the best method of suppressing the convulsions, report favorably. The use of morphia has been decried upon theoretical considerations as tending to lock up the secretions, but this is purely theoretical. When one sees a patient sleeping quietly and bathed in a profuse perspiration one need not worry about theories of the eliminative action of drugs. Veit believes that it does good by producing muscular relaxation. I have often thought that it may act by modifying or preventing the tremendous shock to the nervous system from the profound toxæmia and the resulting convulsions.

Chloral hydrate enjoys a good repute among many competent observers. Clinical work, especially in France and Russia, seems to show that it does not have the deleterious effects of chloroform and recent experimental work by Hopkins leads to the same conclusion. It may be given *per rectum* in milk in doses of thirty or forty grains, repeated as necessary. Fochier has shown that the drug is tolerated by eclamptics in large doses.

Veratrum viride has been lauded by many observers and that it brings about at least a symptomatic improvement cannot be doubted. It is given hypodermatically, in doses of five or ten minims, repeated every hour or two until the pulse falls to sixty. The drug not only shows the pulse but reduces the blood pressure, and its advocates claim that when the pulse is kept at sixty convulsions cannot occur. Polak and others claim that its efficiency is increased by combining it with morphine.

Notwithstanding the favorable reports that have followed the use of chloral and veratrum viride, and without denying that they may form useful adjuncts in many cases, I have not been able to overcome my reluctance to the routine employment of cardiac depressants in eclampsia. I still prefer morphine used with discretion and judgment. To my mind it is a highly significant fact that both those who use chloral and those who use veratrum use morphine also, believing that in this way better results are procured.

I have already referred to the use of oxygen in the toxæmia of pregnancy. I believe it is indicated in all cases and I always use it when it can be obtained. Aside from all theories as to the real cause of the toxæmia and of eclampsia, there is no question that it is symptomatically

indicated. This is clearly shown by the cyanosis and respiratory obstruction. Therefore, its use can be productive only of good, no matter what the cause of the condition may be.

If one adopts the suboxidation theory then the inhalation of oxygen is doubly indicated. It should be used freely and preferably by subcutaneous injection. It is injected under the breasts in ample quantity and absorbed with great rapidity. I have many times observed its good effect.

When the blood pressure is high it may be reduced by nitroglycerin in 1/50 gr. doses, or amyl nitrite by inhalation, and these remedies have, of course, no depressing effect upon the heart.

Eliminative Treatment.—Elimination by the bowels, kidneys, and skin should be encouraged. A drop or two of croton oil, or ¼ gr. elaterium upon the tongue, satisfies the first indication, and in this condition does not seem to be attended by the shock which it usually causes. Later, if necessary, a solution of Epsom salts may be given. After this the bowels may be kept open by Epsom salts, given, if necessary, through the stomach tube. Sweating may be induced by hot packs or by covering the patient with blankets and surrounding her by hot bottles. Pilocarpine is unnecessary and dangerous.

Diuresis is favored by frequent and copious irrigations of the colon with hot salt solution. In my experience this is a valuable method of treatment.

Venesection may also be regarded as an eliminative measure, since some of the toxins contained in the maternal circulation are thus removed. In my opinion this measure is only suited to patients of plethoric habit, with full and bounding pulse, and when immediate delivery is not contemplated. In these cases a single full bleeding is often of benefit. When immediate delivery is contemplated venesection should not be done. The patient may lose enough blood during the delivery and there is a limit to the amount of blood which even an eclamptic may safely lose. In postpartum cases, however, venesection is one of our most valuable measures.

The intravenous injection of salt solution not only has a diuretic action, but serves to diminish the concentration of toxins circulating in the maternal blood. For the man unaccustomed to hospital technic the injection of salt solution under the breasts offers a convenient and efficient substitute.

Zweifel, who holds the view that eclampsia is due to the presence of lactic acid and other intermediate acid products of nitrogenous metabolism, advises the intravenous injection of sodium bicarbonate. I believe that alkalies are beneficial in this condition, and that this fact is further confirmation of the suboxidation theory, since acidosis is a common accompaniment of suboxidation.

Thyroid extract has been used with reported good effect by Nicholson, and parathyroid by Vassale. It seems reasonable to suppose that whatever good effect may result from either of these preparations is due to the

stimulating effect of the thyroid secretion on oxidation and general metabolism.

Sellheim, conceiving the idea that eclampsia is the result of some poison elaborated in the breasts, injected them with oxygen with a view to blocking the circulation, and even went so far in one or two cases as to amputate the breasts. It is to be hoped that the latter procedure will not be imitated. In our own country Healy and Kastle, of the Kentucky Agricultural Experiment Station, acting upon the same hypothesis, have made a remarkable series of experiments in connection with the so-called parturient paresis of cattle, which bears a remarkable and pathological resemblance to eclampsia. Believing the disease to be of mammary origin, they report a remarkable series of cures by the injection of the udders with oxygen. This would seem to afford striking confirmation of my own theory of the etiology of toxæmia and eclampsia, which I have briefly given in the preceding chapter.

Renal decapsulation as advocated by Edebohls has not found favor in this condition. The theoretical considerations advanced in its favor are not sufficient to outweigh the risk of the operation.

Krönig and, following him, several others have resorted to lumbar puncture, but the results have been indecisive.

Engelmann has used hirudin, or leech-extract, intravenously with the idea of preventing coagulation of the blood, and thus preventing the formation of the multiple thrombi which are so prominent a feature in the pathology of eclampsia. The remedy is still on trial.

Summary of Treatment.—The young and inexperienced practitioner, called suddenly to a case of eclampsia, is apt to be confused by the sudden and alarming character of the situation and by the multitude of varying expedients and remedies that have been recommended in different quarters. He may console himself, however, with the reflection that the means that are of real value are few, and usually not difficult of application.

While it is true that the obstetrical treatment is usually the most important, one should not forget the employment of other curative measures. The necessary preparations for delivery, and the various steps of its performance, may require several hours, and in some cases it may be unwise to attempt immediate delivery. Meanwhile one should not be idle. If there are no contra-indications ¼ gr. to ½ gr. of morphine should be injected and repeated as necessary. Anæsthetics are for the most part unnecessary and dangerous. They should be reserved for operative delivery. The membranes should be ruptured. Oxygen should be procured if possible and given freely, especially during the convulsions. A folded towel should be placed like a bridle between the patient's jaws to prevent injury to the tongue. A drop or two of croton oil should be placed upon the tongue and the colon freely irrigated with hot salt solution. The patient should be covered with blankets and surrounded by bottles, not too hot, until free perspiration is induced.

The attendant should then make a careful examination and consider attentively the probable difficulties of delivery and especially the condition of the cervix. He should also consider his own experience and skill, remembering that in some hands the remedy may be worse than the disease. This applies to pure obstetrics as well as to surgery and surgical gynæcology. For example, experience has taught me that manual dilatation and high forceps or difficult version are, in the hands of a surgeon or gynæcologist not well versed in obstetrical technic, quite as dangerous to an eclamptic patient as is the Cæsarean section in the hands of a fairly well equipped general practitioner.

Personally, I believe that the shock of an operative delivery is much increased by the outbreak of eclampsia. In toxæmia it does not seem to be attended by the same amount of shock. Moreover, the longer an attack of eclampsia is allowed to continue, and the more profound the coma becomes, the more easily is the patient affected by any surgical interference. Therefore, once the operator has made up his mind that delivery is indicated, and that he knows how to accomplish it, the sooner it is performed the better. The advice so often given, that before proceeding to operative delivery one should wait until all other measures have failed, is in the highest degree illogical. Operative delivery soon after the first convulsion carries a far better prognosis than the same measure performed as a last resort.

During convalescence perfect quiet should be enforced, the patient should remain quietly in bed for a week or more and a diet, chiefly milk, should be continued. A cracker, or a little bread and butter occasionally to relieve the monotony, will do no harm. She should be encouraged to drink large quantities of water. Iron in one form or another is indicated to help make up for the loss of albumen and to counteract the anæmia which is always present. Fresh air is of the greatest importance. The patient's room should be well ventilated and time spent in the open air, *e.g.*, reclining in an easy chair or upon a couch is well spent. Only when her condition has perceptibly and distinctly improved and the albumen has disappeared from the urine should she be permitted gradually to resume her usual diet and later her accustomed habits of life.

In the postpartum cases there is, of course, no purely obstetrical treatment, but the medical treatment as outlined above should be carefully followed out. If the indications for venesection are present it is especially useful in these cases.

The Vomiting of Pregnancy

The so-called "morning sickness" of early pregnancy is so common that it is hardly to be regarded as abnormal. Indeed, it is one of the most reliable of the presumptive signs of pregnancy. Sometimes, however, the condition becomes exaggerated. The nausea and vomiting are not limited to the morning hours, but continue throughout the day and night. Not

only is food rejected, but vomiting may continue when the stomach is empty. The condition may become so exaggerated as to impair the general nutrition of the patient or even to threaten her life. The morning sickness has become the "vomiting of pregnancy."

Here again, as in the case of eclampsia, we are obliged to use a term that is purely empirical. Vomiting, of course, is only a symptom, not a disease. In this case it is the chief symptom of a condition the essential nature of which we do not as yet understand.

Etiology and Classification.—The underlying cause of the vomiting of pregnancy is not known. The most plausible hypothesis advanced is that of toxæmia, but no serious attempt has been made to explain the nature of the supposed toxin or toxins. Stone, Ewing, and others, believe that the vomiting of pregnancy, preëclamptic toxæmia, eclampsia, and acute yellow atrophy of the liver are all results of one and the same cause, acting under different conditions and at different periods of pregnancy. This has not as yet been proven. It has been shown, however, that they all have certain things in common. For example, they are all accompanied by profound changes in nitrogenous metabolism and in the oxidative functions of the liver. To me it is most suggestive that oxygen has been found useful in the vomiting of pregnancy. There are still, however, many clinical and pathological differences to be explained, and many apparent contradictions to be reconciled, before this theory can be accepted.

There is no doubt whatever that the condition is more common in neurotic and hysterical subjects and in patients of neurotic heredity. Some women have a better appetite and digestion during pregnancy than at any other time.

Whitridge Williams, who has made exhaustive studies in this field, recognizes three varieties of vomiting: neurotic, toxæmic, and reflex. He admits, however, in the latest edition of his work, that his belief in reflex causes of vomiting is rapidly diminishing. Personally I agree with him and with Kaltenbach, Bumm, and others that the alleged cures in these cases are, for the most part, the result of the procedures employed for the relief of the supposed causes, such procedures acting by suggestion. I regard this as clearly proven by the fact that Copeman's method of simple dilatation of the cervix with the finger unquestionably produces good results in many cases. Moreover, certain conditions often regarded as reflex causes, *e.g.,* constipation, really act by increasing the toxæmia.

In spite of all this, however, it must be admitted that the existence of a reflex cause is possible during pregnancy, as at other times, and it should be carefully sought for in every case which does not respond to treatment. Among alleged reflex causes are tumors, displacements, erosions of the cervix, etc.

Most cases then are either neurotic or toxæmic. It is quite likely that toxæmia is the underlying cause in many of the cases that are put down as neurotic. Some writers, indeed, believe that toxæmia is the ultimate

cause of all kinds of vomiting, even including the usual morning sickness. This, however, is probably an exaggeration since some women vomit almost from the moment of conception and it can hardly be claimed that toxæmia begins with the beginning of pregnancy.

Pathology.—It appears that in the vomiting of pregnancy, as in eclampsia, the brunt of the burden falls upon the liver. According to Williams the process differs from that of eclampsia, consisting in necrosis beginning in the centre of the lobules, or in general fatty degeneration of the organ; whereas in eclampsia it is the result of thrombosis, and begins in the periportal spaces. As in eclampsia, however, the kidney changes are degenerative rather than inflammatory and are only marked in severe cases and in those approaching a fatal termination.

On the whole the lesions are much the same as in acute yellow atrophy of the liver.

Williams believes that the difference in the pathology is so marked that the cause of toxæmic vomiting must be essentially different from that of preëclamptic toxæmia. This the future will determine.

Clinical History.—The condition is emphatically one of early pregnancy. It usually begins in the second month, though it may begin earlier. As the months pass its appearance becomes less probable. When, however, it begins early in pregnancy it may continue until the patient is delivered at or near term, as I have myself witnessed.

Nausea and vomiting occurring after the fifth or sixth month of pregnancy often indicate preëclamptic toxæmia; less often nephritis or some other intercurrent or complicating disease.

The symptoms of the neurotic type, or of the mild or benign type, as it is often called, are simply those of the ordinary morning sickness somewhat exaggerated. Instead of being confined to the early morning they continue with more or less persistence during the day and night. The patient vomits much of what is taken into the stomach, but by no means all, and sometimes less than is supposed. She is nervous and depressed. Constipation is the rule. The face is pallid and the patient obviously more or less anæmic. The pulse remains normal, however, and the loss of flesh is not marked. Urinary changes are slight or absent.

TOXÆMIC VOMITING

The clinical history of this condition has been well studied in France, where the condition seems much more common than in Germany, England, or America. The older writers styled this pernicious vomiting. This designation, though colloquial rather than scientific, is certainly very appropriate and expressive. Its beginning is usually the same as that of the neurotic type, but the symptoms do not respond to treatment, and the case goes on from bad to worse. The first distinctive evidence of the toxæmic or severe type is rapid loss of flesh. This symptom, indeed, is the chief characteristic of the first stage.

Dubois, who has written upon this subject with singular accuracy and clearness, recognizes three stages:

The first period, or period of emaciation; the second period, or period of rapid pulse; the third period, or period of cerebral symptoms.

First Period

After a varying period of what is regarded as the neurotic or benign type of vomiting the symptoms gradually become more severe. The patient now vomits not only after taking food but also when no food has been taken. The loss of flesh now becomes quite perceptible, and from this time on is rapid. The constipation, which is a constant accompaniment of even the milder forms, becomes more obstinate, and the urine diminishes in quantity. Ptyalism is common.

Second Period

During this period emaciation continues and albumen appears in the urine, but the most characteristic symptom is the increased rapidity of the pulse, which may vary from 100 to 120. Jaundice and tenderness over the liver are ominous symptoms pointing to grave toxæmia. There is no fever, but on the other hand the temperature may be subnormal. The vomited matter becomes black from admixture of blood. Gingivitis is common.

Third Period

This is the terminal stage and was characterized by Dubois as the period of cerebral symptoms. The urine is dark in color and almost complete suppression may ensue. Jaundice may become marked and the skin very dark in color. Delirium and coma precede the fatal termination.

In this country, at least, the stages are not always so clearly marked, nor are the symptoms so definite or characteristic. The third stage is seldom seen, perhaps because patients are not allowed to reach this stage.

In certain cases, fortunately very rare, toxæmic vomiting runs an acute and very rapid course, ending fatally in two or three weeks.

Diagnosis.—The symptoms of the vomiting of pregnancy are usually unmistakable, though one should not forget the possibility of ulcer of the stomach. It should be remembered that, as noted above, nausea and vomiting occurring during the latter months are more commonly an evidence of preëclamptic toxæmia. Persistent vomiting may precede a convulsion.

By far the most important point with reference to the diagnosis is the distinction between the benign and the pernicious forms, or, to use the current phraseology, between the neurotic and toxæmic types.

This is, indeed, of the highest importance and may determine the final result, for the methods of treatment of the two types are diametrically opposed.

In the severe type the patient vomits, not only after taking food, but

also when the stomach is empty. The pulse is often, though not always, continuously rapid. Emaciation is progressive. Slight jaundice and tenderness over the liver may appear. These signs should always be carefully weighed. To wait for the phenomena of the third stage is to wait too long.

Most important is the evidence afforded by urinalysis. According to Soudern and others acidosis is an early symptom of toxæmia. Albuminuria and a diminution in the total quantity of urine are danger signals.

According to Williams the urine of toxæmic cases shows a high ammonia coefficient, 20 to 50 per cent., as opposed to the normal coefficient, which is 4 or 5 per cent. In other words, the amount of nitrogen eliminated as ammonia is proportionately very large. The urea and total nitrogen are diminished. This sign may afford valuable corroborative evidence, but its recognition requires the services of an expert analytical chemist. Moreover, since it may be present in the terminal stages of any exhausting disease, or in acidosis from any cause, it is of negative rather than positive value. For example, if the ammonia coefficient is 5 per cent. or less, the vomiting is not toxæmic in character and even when the coefficient is high this may be due to inanition from any cause, or to other conditions which seriously interfere with metabolism. Nevertheless, if further experience shall confirm these conclusions it will prove of great value in deciding the question of the induction of abortion.

In the majority of cases then the practitioner will still be obliged to fall back upon the clinical evidences already discussed.

The duration of the neurotic cases varies from a few weeks to several months, and in some cases even to the end of pregnancy. The duration of the toxæmic cases averages two or three months. In certain cases, fortunately rare, the toxæmic variety runs a very rapid course, ending fatally in a week or two.

A single word of caution. The physician should not take it for granted that the vomiting of pregnancy is impossible in unmarried women. I recall a case in which the patient was supposed to be suffering from ulcer of the stomach. She was unmarried and no suspicion of the real condition was entertained. Every case of persistent vomiting in a woman of child-bearing age should be made the subject of careful investigation.

Prognosis.—There is a mysterious and unaccountable difference in the figures given by different observers. The French, unquestionably acute observers, and with more material at their command than others, report a mortality of 30 per cent. in the severe type. In Germany the mortality is much lower, while Carl Braun, of Vienna, in an enormous experience, has never seen a fatal case. Part of this difference, but certainly not all, may be accounted for by the fact that the induction of abortion is resorted to earlier in Vienna and in Germany than in France.

In the neurotic type the prognosis is good. With proper treatment the cure is neither difficult nor delayed. This is also true of the rare cases in

which the trouble can be traced to some reflex cause. In the true toxæmic cases the prognosis is always grave, especially if the condition is allowed to continue. It must be, however, that this form is for some reason more common in certain countries and localities. I am sure that cases of death from the vomiting of pregnancy are rare in New York and vicinity.

Treatment.—More interesting to the practitioner than all these theoretical considerations, fascinating as they are, is the question of treatment.

It is well to clear the ground at the outset by a systematic search, external and internal, for the reflex causes of vomiting. Personally, I am of the opinion that most of them are imaginary, but that they do occasionally occur, is unquestionable. Moreover, such an examination, especially if the patient be allowed to regard it as a curative measure, often works wonders by suggestion.

Of course if any abnormality is discovered it should be corrected. Operable tumors should be removed, displacements corrected, ulcerations cauterized, etc.

I believe that Kaltenbach's conception of the vomiting of pregnancy as a neurosis marked an important advance in the treatment of this condition, and am free to confess that I had little success until I began to treat it upon this basis. The number of remedies that has been suggested is legion. Among them may be mentioned creosote, calomel, iodine, bismuth, cerium oxalate, pepsin, ingluvin, opium in one form or another, the bromides, chloral, and various others. In my opinion the best of these are those which have a sedative or hypnotic action. The aerated waters are always refreshing in nausea, and the old prescription of Fordyce Barker, a drachm of sodium bromide in a siphon of carbonated water, a draught to be taken every few hours, is often useful. Cocaine in doses of gr. ¼ may give temporary relief; or the pharynx and nares may be sprayed with a 1 or 2 per cent. solution, thus abolishing the sensation of swallowing. Morphine hypodermatically may bridge over a temporary emergency. Adrenalin, in doses of ten drops of a 1 to 1000 solution, by the mouth, twice daily has proved successful. Pepsin, hydrochloric acid, and similar agents are usually of little or no value, as might be expected, since the condition is ordinarily neurotic or toxic rather than gastric. In cases, however, in which the patient has been a dyspeptic before pregnancy, I have obtained good results from liquid taka-diastase in doses of one or two teaspoonfuls.

These patients are usually constipated and for the relief of this condition I have found cascara very useful. It should be given regularly for a time, the dose and the intervals between doses being adapted to the individual case. It may sometimes be advantageously combined with the tincture of nux vomica. Salines are to be avoided as tending to increase the anæmia already present. For the latter symptom some preparation of iron should be given.

The French, who regard this condition as an auto-intoxication of in-

testinal origin, attach great importance to thorough flushing of the intestinal canal, and this measure is doubtless of some benefit. Williams reports great relief in some cases by washing out the stomach and leaving therein 500 c.c. of a 1 per cent. solution of sodium bicarbonate. It is a curious fact that here, as in preëclamptic toxæmia, relief may sometimes be obtained by the inhalation of oxygen. This, together with the benefit sometimes derived from the administration of alkalies, tends, I think, to confirm my belief, expressed elsewhere, as to the importance of combating suboxidation during pregnancy. It would also seem to indicate that there is some connection between the two conditions.

Dietetic Treatment.—This is of less importance than one would suppose. If the patient vomits on rising or after breakfast, a cup of coffee or some preferred article of food should be taken while she is still in bed and in the recumbent position. As a rule acids are to be avoided and alkaline drinks like vichy or milk and lime water are to be advised. Patients who have been dyspeptics before becoming pregnant should, of course, avoid things that are known to disagree with them, but, on the other hand if a patient suffering from the vomiting of pregnancy expresses a desire for some unusual or apparently unsuitable article of food it may be advisable to allow it. Nature is sometimes the best teacher, and sometimes works by methods unknown to science. Rectal feeding, one egg in four ounces of pancreatized milk every few hours, or liquid peptonoids, may be tried for a few days, or even a week, but is not of as much value as was formerly supposed.

Solid food may be retained when liquid food is rejected, and *vice versa*. Oftentimes solicitous friends give too much food at one time. A teaspoonful may be retained when a teacupful is rejected. Sometimes it is taken better when hot, at other times when ice cold, and so on. A favorite expedient in the French hospitals is to give the *soupe de pain cuit* of Fochier. This consists of buttered toast made into a very thick soup with water and a little salt added. This is often retained by the stomach. The mere weight of the mass makes its rejection difficult. According to Fabre if it is once retained the case is cured.

In rebellious cases of the neurotic type sanitarium treatment, or at all events a complete change of scene and surroundings, may effect a cure after all else has failed.

Upon the hypothesis that the vomiting of pregnancy is due to the absence of certain antibodies that should be present in normal pregnancy, and that serve to counteract the injurious effects of the invasion of the circulation by fetal elements, various observers have recently treated the condition by the hypodermatic injection of serum taken from the blood of a pregnant woman near term. Reports seem to indicate that this procedure is worthy of further trial. Injections of salt solution, the tube being carried far up into the colon, are very valuable. The patient lies with the head low and the hips elevated and the solution is allowed to enter

drop by drop. In more urgent cases the subcutaneous injection of salt solution in liberal quantities should be practised. Both these measures are to be highly recommended.

The physician should make his personality felt from the beginning. He should be confident and impart his confidence to the patient. If medicine is given or manipulation performed it should be done with the full assurance of cure. Keeping the patient in a darkened room and giving a little bromide in camphor water (Hirst) often suffices. An ice-bag over the epigastrium serves to diminish reflex irritability.

In the toxæmic variety, as determined by progressive emaciation, constant rapidity of the pulse, persistent vomiting when the stomach is empty, and perhaps by a high ammonia coefficient, the induction of abortion must be seriously considered. These cases involve a serious responsibility and the advice of an experienced colleague should always be sought.

In the induction of abortion ether or nitrous oxide should be employed, and with a liberal admixture of oxygen. In my opinion it is better to dilate the cervix carefully with the Hegar dilators, rupture the membranes, and tampon cervix and vagina. This can be done in a few moments and with practically no hemorrhage or shock. Strangely enough, the mere rupture of the membranes sometimes stops the vomiting at once.

In the induction of abortion ether should be the anæsthetic, and it should be given with a liberal admixture of oxygen. If the cervix is dilated, or easily dilatable, it is well to complete the process at one sitting. On the other hand, if the cervix is rigid and undilatable and especially if the patient has passed the second month and the ovum has acquired considerable bulk, it is far better to dilate the cervix cautiously with the Hegar dilators until it will admit the tip of the finger, then rupture the membranes and tampon the cervix, lower uterine segment, and vagina. All this can be done in a few moments and with practically no hemorrhage or shock. The process completes itself or may be easily completed the next day. Strangely enough the mere rupture of the membranes sometimes stops the vomiting at once.

Acute Yellow Atrophy of the Liver

It is a remarkable fact, and one hitherto unexplained, that pregnancy predisposes to acute yellow atrophy of the liver. More than one-half of the reported cases have been observed in pregnant women. Indeed, it was called *icterus gravis* by the older writers. It is unnecessary to rehearse the pathology here. The liver changes are for the most part confined to the lobules, which undergo partial, or in bad cases almost complete, necrosis. With this process there goes an acute parenchymatous nephritis and fatty degeneration of the heart. The association reminds one of the pathological picture in toxæmic vomiting.

Clinical History.—The symptoms may appear at any time during pregnancy, or may follow labor by a few days. They are usually observed,

however, during the latter months. The most distinctive symptom is jaundice, which may be slight or well marked, and coma, which may develop slowly or gradually. In the acute cases the onset is sudden and severe, with headache, vomiting, purging, abdominal pain, and perhaps delirium and convulsions. The vomited matter may be blood stained, or of the coffee-ground variety, as in the last stages of the vomiting of pregnancy. Premature delivery of a dead fœtus is common.

Local Signs.—These are determined by palpation and percussion. Tenderness over the liver is marked, and diminution of the area of dulness rapid.

Urinary Findings.—The urine is much diminished in quantity and contains albumen, blood, bile, casts of all kinds, indican, and acetone. The amino-acids are increased. According to Williams the excretion of urea is much diminished while the ammonia coefficient is relatively very high.

For the general practitioner without a laboratory at his disposal the presence of bile, blood, and albumen should be sufficient.

Diagnosis.—Without doubt the affection has often been mistaken for eclampsia, and probably the differential diagnosis is not always possible. The data given above should be sufficient. It has been confounded with phosphorus poisoning, which is also attended by fever, jaundice, convulsions, coma, coffee-ground vomit, and oddly enough by the same or very similar pathological lesions. Here one would have to depend upon the history of the case, and upon the chemical examination of the vomitus, the dejections, and the urine.

Prognosis.—This is bad. Few cases recover.

Treatment.—The only treatment for this disease, a disease which is almost uniformly fatal, destroying mother and child alike, is the artificial interruption of pregnancy. If an anæsthetic is necessary, chloroform, which may still further damage the liver, should be avoided. The medical treatment is in a general way the same as that of preëclamptic toxæmia.

Chorea Gravidarum

Chorea, occurring as a complication of pregnancy, may assume a severe type. Often the constant movements make rest or sleep impossible, and exhaustion rapidly supervenes. The worst type is that which develops during pregnancy. When the disease was present before conception the symptoms are less severe. There seems to be a special relation between the disease and pregnancy. Fever, delirium, and coma are observed in the severe cases, the clinical picture reminding one of toxæmia. As in the vomiting of pregnancy, however, there seems to be a strong mixture of the neurotic element, and Wade reports a recovery by Copeman's method of cervical dilatation.

The condition is always serious, the maternal mortality being as high as in eclampsia, *i.e.*, 20 or 30 per cent. The occurrence of fever is a bad

prognostic sign. Abortion and premature labor are common. Many of the severe cases abort spontaneously.

Treatment.—Arsenic, iron, cod liver oil, if well borne, and general hygienic measures are indicated. Possibly the serum treatment might be beneficial. Sedatives may be necessary to reduce motor excitement and secure sleep. Aggravated cases may require the induction of labor.

Many other affections of pregnancy are regarded as more or less toxic in origin. The term toxæmia is a sort of cloak that is conveniently used to cover many things that are as yet only "seen through a glass darkly." For example, neuroses, psychoses, dermatoses, and many other morbid conditions, are often attributed to toxæmia and doubtless are due in large part, or in many cases, to misunderstood perversions in metabolism resulting from the failure of the organism to meet the demands of pregnancy. Until, however, the whole matter is better understood, we will avoid confusion by considering them from a purely clinical stand-point.

CHAPTER XIV

INTERCURRENT AND COMPLICATING AFFECTIONS

During pregnancy, as at other times, women are subject to the various diseases and disabilities to which the flesh is heir. It cannot be said, however, that they are more subject to them than their non-pregnant sisters. Indeed, it would seem that, in the case of some women at least, nature confers a sort of immunity from intercurrent affections. Then there are the fortunate patients who feel better during pregnancy than at any other time. Of this class we all see frequent examples.

To consider every disease that might possibly occur during pregnancy would be an endless and profitless task. We will limit ourselves here to the more common affections, and to those which affect the course of pregnancy in some special manner, or are themselves modified in some special way by the fact that they occur during pregnancy.

Let us take up first the chronic infectious diseases. Of these there are two which are of great interest and importance, syphilis and tuberculosis.

Syphilis

It is a well-known fact that syphilis is by far the most common cause of abortion, of premature labor, and of still birth. These sad results, however, occur chiefly in cases in which the patient contracts the disease before conception. In this event the child, even if delivered alive, is always syphilitic. This is true also, though to a less extent, of those cases in which the disease is transmitted at the time of conception or later.

Strangely enough, however, in these so-called conceptional cases it is quite possible for a syphilitic father to beget a syphilitic child without, at the same time, infecting the mother. In this case the mother appears to acquire immunity from the disease, as shown by the fact that she does not contract it from the fœtus. For example, she may with impunity nurse her child, even though it has specific lesions about the mouth.

This merciful dispensation of nature is known as Colles's law. Unfortunately it is not of universal application. Now and then the mother, though not contracting the disease from the husband, may contract it indirectly from the child begotten by him; the *cuoc en retour* of the French writers.

Sometimes by a singular inversion of Colles's law the child of a syphilitic mother acquires immunity from the disease. For example, the child may nurse the mother with impunity even though the latter may have specific lesions of the nipple. This is known as the law of Profeta. It has recently been shown, however, that these children, though free from symptoms, give a positive Wassermann reaction.

The discovery of Colles's law of immunity naturally led to the belief

that the disease is transmitted through the spermatozoa. This has been disputed on the ground that the spirochæta pallida is much too large to be contained in the head of the spermatozoön, and on the further ground that these supposedly immune mothers give a positive Wassermann reaction. Those who hold this opinion assume the existence of what they call latent syphilis in the mother. To my mind clinical experience rather than laboratory results constitute the final test, and judged by this standard Colles's law still holds good.

Granting, for the sake of argument, the truth of Colles's law, how is it to be explained? How is the immunity of the mother brought about? The best explanation seems to be that certain products of fetal metabolism are transmitted through the placenta to the mother and act as immunizing agents. Profeta's law is to be explained in the same way except that here the process is reversed, the immunizing products passing from the mother to the fœtus.

Clinical History.—The student is often left to assume that the course of syphilis during pregnancy is the same as in the non-pregnant condition. This is by no means correct. Syphilis modified by pregnancy has a symptomatology of its own.

If the mother contracts the disease at the time of conception, or if conception occurs during the early period of the disease, the secondary symptoms, especially the anæmia and the headaches, are more severe than otherwise. In other words, the more recent the syphilis the more pronounced the symptoms.

Owing to the increased blood supply of the genitals during pregnancy, the initial lesion is more prominent and tends to become phagedenic in character. If, however, the initial lesion occurs elsewhere it is not modified by the disease. Mucous patches are very obstinate, remaining for a long time, and assuming a condylomatous appearance (Fabre).

If a pregnant woman is infected before the fifth month of her pregnancy the child will probably inherit the disease. If the infection dates from a later period the child usually escapes.

In this postconceptional syphilis, as it is called, the clinical course of the disease differs somewhat from that already described. The secondary symptoms are not pronounced. The eruption is not well marked and the glandular enlargements rapidly disappear. According to Fabre mucous patches and pigmentations of the neck, the so-called Collar of Venus, are seen in only about five per cent. of the cases. The same writer calls attention to the value of headache, more severe at night, as a diagnostic feature, its nocturnal character serving to distinguish it from the headache of preëclamptic toxæmia.

The disposition of the mother to abortions and premature labors, and the frequency of still-born children, are due to certain lesions of the placenta and membranes, and secondarily of the fœtus, which are peculiar to syphilis and which merit separate consideration.

The placental changes are in part apparent even to the naked eye. The placenta is much increased in size and much lighter in color. Pinard was wont to say that if the placental weight is more than one-sixth the weight of the fœtus the case is one of syphilis. It has been shown, however, that this rule, while suggestive and valuable, is subject to exceptions. In some cases the placenta is considerably heavier than is here indicated. Fabre reports a case in which the fœtus weighed 1700 grammes and the placenta 1400 grammes. In the conceptional cases it may not be enlarged at all; not even relatively. The microscope reveals endarteritis, endophlebitis, and cellular proliferation in the chorionic villi. These changes

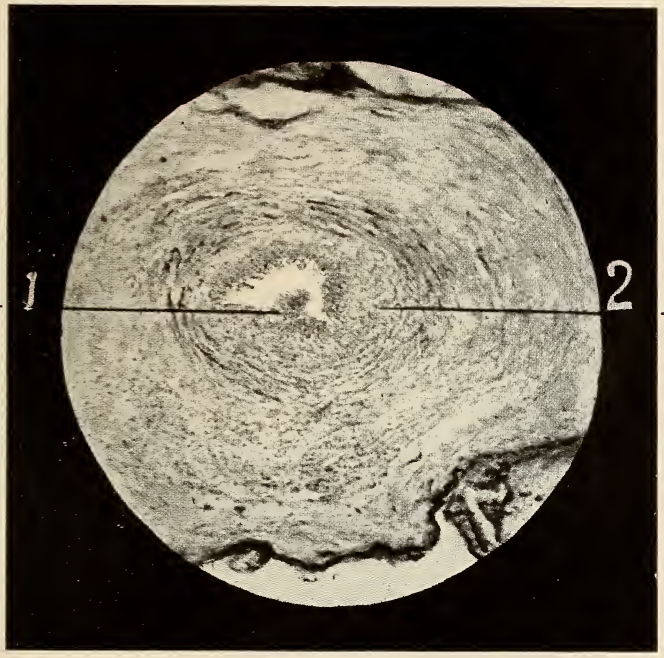

FIG. 173.—Microphotograph of syphilitic artery.

render the villi larger and give them the well-known club-shaped appearance characteristic of this condition. It is at once apparent that these changes are sufficient to account for the frequency of fetal disaster. The spirochætæ pallidæ, while easy to find in the dead fœtus, are rare in the placenta and many observers have failed to find them at all (Figs. 173, 174 and 175).

When the fœtus dies *in utero* it soon becomes macerated (Fig. 176). The distinctive feature of maceration is the loosening and separation of the skin from the underlying tissues which are of a vivid red. Any handling of the child, even the necessary manipulations, carefully conducted,

results in further peeling off of the skin. The child is much below the usual size. The skull is soft and compressible and the abdomen is distended. Without going deeply here into the subject of the pathology

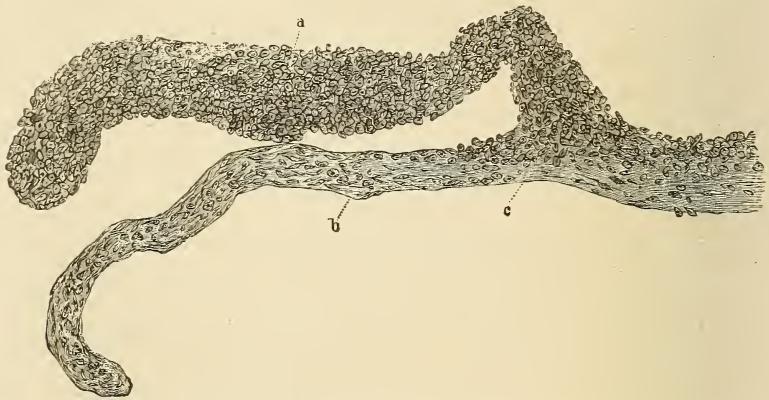

FIG. 174.—Villi from the line of demarcation between healthy and diseased placental tissue. (Fränkel.) *a*, swollen villus filled with granulation cells; *b*, slender, almost healthy villus; *c*, transition from healthy to diseased villus.

FIG. 175.—Syphilitic villus of the chorion. (Fränkel.)

of fetal syphilis it may be said that the principal well-established lesions consist in interstitial changes in the liver and spleen with marked enlargement of those organs, in less marked but similar changes in the lungs, pancreas, testicles and elsewhere, and in the familiar osteochondritis of

the long bones. The spirochætæ are present in large numbers. One need not be a trained pathologist to secure strong presumptive evidence.

Fig. 176.—Macerated fœtus.

According to Grafenburg, maceration is of specific origin in eighty per cent. of the cases and according to Whitridge Williams a marked increase

in the size and weight of the liver and spleen justifies the diagnosis of syphilis. The reader should remember that there are other causes. Syphilis is not the only cause of maceration. It is observed in mole pregnancy and may occur whenever a dead fœtus remains long *in utero*.

More important to the practitioner are those evidences of fetal syphilis that are visible to the eye. It is imperative that he be familiar with these, for if he fail to recognize them proper treatment will not be instituted, and much harm both to mother and child may result.

The syphilitic child is much smaller than normal. The subcutaneous fat seems to be absent or much diminished, the skin is folded and wrinkled, and the child looks prematurely old. A dingy gray color takes the place of the rosy hue of the healthy child. In some cases jaundice is present. The skin cracks open easily, especially at the flexures of the joints. Bullæ may be present upon the palms of the hands or the soles of the feet. This sign is highly characteristic.

The Wassermann reaction may be negative, both as to the blood and the cerebrospinal fluid, less often with the latter.

Even before delivery one may make a provisional diagnosis of syphilis in the fœtus if, with a suggestive history, one finds evidences of maceration. These evidences are somewhat as follows: The abdomen ceases to enlarge. The fetal heart sounds disappear. The fundus is found at a lower level than that which should correspond to the existing period of pregnancy. According to Fabre one can predict the death of the fœtus several days in advance by noting the gradual slowing of the heart sounds. The fœtus is felt simply as a foreign body *in utero*. The back cannot be made out nor can the small and softened head be recognized.

Hydramnion may be present and in some cases the distention may become excessive, even requiring the induction of labor. The distention develops gradually, in contrast to that of the hydramnion of twin pregnancy, which may appear suddenly and increase rapidly.

The gross changes in the placenta constitute a valuable means of diagnosis and the pathological conditions which cause these changes explain the fetal mortality. The accompanying endarteritis and endophlebitis by obliterating the vessels so interfere with the fetal and maternal interchange, that the death of the fœtus often becomes inevitable.

Treatment.—On the whole the treatment of syphilis during pregnancy does not differ materially from that ordinarily employed. The reader will do well to remember, however, that during pregnancy mercurials are not well tolerated by the stomach. For this reason inunctions are to be preferred. Extensive experience at the New York City Hospital has shown us that salvarsan can be employed during pregnancy without danger to mother or child. As in other conditions, it is especially valuable when the local lesions are marked. Treatment should be instituted early, whenever possible, but it should never be omitted because the disease was

contracted late in pregnancy. Nor should it be omitted in cases of habitual abortion or of habitual premature death of the fœtus, or when the husband is syphilitic, even though the mother shows no sign of the disease. In addition to the specific medication the general nutriment should be conserved in every possible way. A liberal diet and an abundant supply of fresh air are indispensable.

Jeannin advises that, if the disease is not contracted until the patient is seven and one-half or eight months pregnant, labor be induced in order to prevent the development of syphilis in the child. It has been shown that in syphilis acquired during the latter months, *i.e.,* in the late post-conceptional cases, the disease may not be transmitted to the fœtus until the last month of pregnancy.

The local lesions should be promptly and energetically treated, and if possible cured before the advent of labor, since their presence markedly increases the danger of infection.

It should not be forgotten that patients suffering from syphilis are poor subjects for major surgery. I recall the case of a patient who died of infection after the Cæsarean section during my interneship at the City Hospital.

No man who has suffered from syphilis should be permitted to marry in less than four years from the beginning of the disease, and not then unless with the approval of a competent syphilologist and after every test, including of course the Wassermann reaction, has been employed.

A syphilitic child may nurse its mother but should on no account be given to a healthy woman to nurse. DeLee has with justice emphasized the fact that it is absolutely unjustifiable to impose this risk upon a wet nurse.

Tuberculosis

It was formerly believed that pregnancy is, so to speak, an antidote to tuberculosis, that its occurrence in pregnancy is of good import. This belief was based upon the fact that there is, in many cases, a temporary improvement due to the gain in weight and general nutrition that so often marks the latter half of pregnancy. Abundant experience has shown, however, that tuberculosis, as a complication of pregnancy, is highly undesirable. Sooner or later its bad effects are manifest and often they develop with startling rapidity. This is especially true of the puerperal period. That an acute exacerbation is likely to occur at this time is proverbial.

The symptoms of tuberculosis do not differ materially from those that accompany the disease in the non-pregnant condition. During the early months of gestation the anæmia and general malnutrition are usually pronounced, but in the latter months there is often considerable improvement. Too often, however, this is followed by a rapid decline after delivery.

Strangely enough spontaneous abortion is rare in these cases. Premature labor, however, is common, and is largely due to the mechanical effect of a violent and continued coughing. High temperature may also be a cause.

In my experience the first stage of labor is not materially modified. The second stage, however, is often delayed, the patient being incapable of much voluntary muscular effort. The principal danger at this time is cardiac exhaustion with resulting pulmonary œdema.

Whether the bacilli are transmitted to the fœtus has been the subject of much discussion. Recent investigation tends to show that although this does undoubtedly occur it is exceptional, except perhaps in miliary tuberculosis. Clinical experience tends to confirm this view. We often see children born of tubercular mothers, who are and remain apparently in good health. Friedmann has shown that an infected spermatozoön may carry the bacilli to the ovum, and Williams considers that this fact may possibly account for those cases in which the disease does not appear until some time after birth.

All this, however, does not mean that a patient in whom a slight tubercular process has been arrested, and who has remained for some years in good health, must under all circumstances remain childless. Every physician has seen cases in which such a patient has with good care sustained the ordeal of pregnancy and labor. Such cases should of course be carefully watched and their nutrition conserved in every possible way. If practicable they should lead an out-of-door life during the greater part of gestation.

While some investigators have claimed that tuberculosis may be transmitted from mother to child, every-day experience shows that this is rare indeed. The modern theory is that a tubercular tendency may be transmitted. This, too, is open to question.

Treatment.—The prophylactic treatment is most important since it offers most chance of success. The physician should never omit a complete general examination of his patient, including the heart and lungs, early in pregnancy; and this even if she thinks herself perfectly well. Every case of cough or of rapid loss of flesh should be investigated. In this way, and in this way only, will he discover the evidence of tuberculosis in its incipient stage, when with proper treatment there is still a fair chance of improvement. If he does not make such an examination he may now and then have occasion to regret its omission. If nothing wrong is found no harm has been done. The physician has only shown a proper interest in his patient; an interest which is always appreciated. On the other hand, if incipient tuberculosis, cardiac disease, or nephritis is made out the information may be of priceless value. Of course urinalysis constitutes part of the examination.

On the other hand, if the patient is in an advanced stage of the disease,

or if, even though the disease has made little progress, she is in the latter months of pregnancy, a waiting policy should be adopted. My experience has been that tubercular patients are poor subjects for anæsthesia and the operative procedures that are likely to form part of the induction of labor, and that such procedures, while prejudicing the chances of the child, do not benefit, but rather endanger, the mother.

During labor the patient must be narrowly watched. A long delayed second stage may require the use of the forceps. The deep anæsthesia is undesirable, however. In one very serious case I disobeyed all rules and gave ergot, thus saving the patient an operative delivery. Pituitrin might be indicated here. If an anæsthetic must be given it should be administered in the smallest possible quantity and accompanied by liberal quantities of oxygen. Special precautions should be taken to avoid any postpartum loss of blood. The mother should on no account nurse her child.

Acute Infectious Diseases

SCARLET FEVER

Scarlet fever is, fortunately, of rare occurrence during pregnancy. Abortion or premature labor may occur, but are not as common as in measles. It is always a dangerous complication, since it imposes an additional burden upon the kidneys, already taxed with the elimination of fetal and placental waste.

Many believe that pregnant women are immune to scarlet fever. It has seemed to me that this applies to other diseases as well. It appears that the disease is more common during the puerperium, though doubtless many of the cases reported have been cases of infection accompanied by an erythematous rash.

Ballantyne, who studied the subject exhaustively, believed that the disease may be transmitted to the fœtus, and reported a case in which the child was born with a rash which he believed to be that of scarlet fever.

The immunity from scarlet fever, which pregnant women seem to enjoy, continues during the puerperium in which, according to Meyer, the disease does not occur in more than 1 per cent. of those known to have been exposed. It is a matter of common knowledge that puerperal patients occupying the same room with children suffering from scarlet fever seldom contract the disease. Of course this is no excuse for carelessness

The chief interest of the physician centres in the fact that the diagnosis is very difficult, since erythematous rashes are not uncommon in cases of septic infection. As is well known, atypical cases of scarlet fever are quite common, and this materially increases the difficulty. Moreover, and this is not commonly known, a septic rash may desquamate. If the throat conditions are typical, and the urine contains albumen, the diagnosis is plain. A history of recent exposure also has some bearing, although not as much

as in the non-puerperal woman. In many cases the data are not sufficient for a positive diagnosis. In doubtful cases it is best to take all necessary precautions in the way of isolation and disinfection. In this way the interests of the patient are best served and the attendant escapes the possibility of criticism.

In my opinion many of the cases reported as scarlet fever were really cases of infection accompanied by erythemata. Since the introduction of the antiseptic system we have heard little of epidemics of scarlet fever as a complication of the puerperium. There is an old hospital tradition, probably founded upon fact, that scarlet fever is especially likely to be communicated to those having open wounds. It is very interesting to note in this connection that the streptococcus which recent investigations have shown to be the probable cause of scarlet fever is, as we know, the usual cause of septic infection in the puerperium.

The child often escapes, even when the diagnosis in the case of the mother is undoubted.

MEASLES

This disease is also uncommon during pregnancy. When it does occur it is a serious matter. Bronchopneumonia as a complication is relatively frequent. Fellner reports abortion or premature labor in 55 per cent. of his thirty cases and a maternal mortality of 15 per cent. He emphasizes the gravity of the affection when occurring in the puerperium. Numerous cases in which the disease was transmitted to the fœtus have been reported.

PNEUMONIA

During the latter part of pregnancy pneumonia is an extremely dangerous, and often rapidly fatal, complication. Premature labor is the rule. The diminution of the oxygen supply, already scanty, is a factor most prejudicial to both mother and fœtus. Strangely enough, the mortality is much higher when premature labor occurs than when it does not. Perhaps this is partly because it occurs more frequently in the severe cases. Then, too, the strain of labor upon the already overburdened heart must be a factor. At all events, the lesson is plain. The induction of labor is ordinarily contra-indicated.

I have noted that in the case of a pregnant woman seriously ill with pneumonia, perhaps unconscious and with stertorous breathing, labor may begin and proceed far into the second stage without noticeable symptoms, and this, too, in the case of a primipara. Here the attendant may be surprised by finding the cervix completely dilated, when he had not even suspected the existence of labor. It is well to be on one's guard in these cases.

INFLUENZA

The reports vary markedly with different observers. My own observation has been that the affection, as observed in New York and vicinity,

does not usually interrupt pregnancy or seriously imperil the life of the patient. In severe cases, however, with high fever or constant cough, premature labor is common. Should pneumonia develop the outlook is bad. Some cases, as is well known, are attended by great systemic depression, out of all proportion to the local symptoms. Here, if labor should occur, whether prematurely or at full term, the patient's resources should be carefully guarded and every effort made to forestall *exhaustion* and *hemorrhage*. Chloroform anæsthesia should be avoided.

MALARIAL FEVER

As a complication of pregnancy and the puerperium malarial fever is certainly rare in New York and vicinity, though it is more common in other parts of our country, notably in the Far South. In the severe cases, accompanied by chills and high temperature, pregnancy is often interrupted, especially in the latter weeks of pregnancy.

It is generally believed that the disease may be transmitted to the fœtus, but positive evidence seems to be lacking. Williams, in fifteen cases, failed to find the plasmodium in the blood of the child, though the blood was "carefully and repeatedly" examined in every case, and some of the children were born when the mother was suffering from a malarial attack.

In malarial subjects the disease has a tendency to reappear during pregnancy and the puerperium, especially the latter. When occurring during the puerperium it bears a striking resemblance to pyæmic infection, and without a blood examination the diagnosis may be for a time impossible. This subject is considered in the chapter on puerperal infection.

There has been a tendency on the part of some observers to withhold quinine in these cases, fearing that its use might result in the interruption of pregnancy. This is a mistake. The danger of bringing on labor by the use of quinine is far less than that involved in the continuance of recurring chills and high temperature. This has been my own experience, and I have found it the unvarying testimony of physicians from the Far South studying at the New York Polyclinic.

TYPHOID FEVER

The coincidence of typhoid fever and pregnancy is rare. Pregnancy is said to be interrupted in more than one-half of the cases. Yet I have watched a patient in her progress through a typical attack of typhoid and a typical convalescence and seen her delivered without untoward incident. It was an unusual and uncanny task to trace the distended and tympanitic coils of intestine that lay above and in front of the uterus which extended far above the umbilicus.

F. W. Lynch, of the Johns Hopkins clinic, has demonstrated the bacilli

in the organs of the aborted fœtus. This helps to account for the frequency with which pregnancy is interrupted.

Occurring in the puerperium, the disease may be confounded with sepsis, and the diagnosis may be difficult for a time. The history will help and the subacute bronchitis, so familiar to those who have seen much of typhoid, is not characteristic of puerperal sepsis. The Widal test should never be omitted.

The attendant should not forget that wounds in the genital tract may be the seat of inoculation by the typhoid bacillus, a true puerperal infection resulting.

ERYSIPELAS

This is not very common in child-bearing women. Although this disease is a typical streptococcus infection, and would seem to be especially dangerous in pregnancy and the puerperium, experience does not show this to be the case. The transmission of the infection to the genitalia is possible, however, and may occur in two ways, either directly, *e.g.*, by the hands of the patient, or indirectly through the blood current. Fatal cases have been reported. Pregnancy is not usually interrupted. Transmission to the fœtus has been observed.

Treatment.—The erysipelas should be cured as soon as possible. The best application in my experience is a 50 per cent. ichthyol ointment under oiled silk. The parts should be covered with sterile dressings and all handling of the genitalia scrupulously avoided.

OTHER LOCAL INFECTIONS

Streptococcic inflammation of the throat, abscesses of various kinds, etc., may complicate pregnancy and the puerperium, and may, in rare instances, cause an antepartum or postpartum infection in one or the other of the two ways mentioned above.

ACUTE MILIARY TUBERCULOSIS

This condition makes rapid progress during pregnancy and the diagnosis is difficult. It is of special interest in this connection since it may be mistaken for an acute puerperal infection.

The rarer acute infectious diseases, smallpox, cholera, typhus, are all serious complications of pregnancy and usually result in abortion.

Of smallpox we see little in this country, but those who have had opportunities for observation report the maternal mortality as high and the interruption of pregnancy as very common. Vinay reports 36 per cent. maternal mortality. The disease is often transmitted to the fœtus *in utero*, as is said to have occurred in the case of the famous accoucheur, Mauriceau. Schutz reports that in the Hamburg cholera epidemic more than half the cases died and that abortion was very common. Occasional transmission of the disease to the mother was observed.

Diseases of the Circulatory System

CARDIAC DISEASE

Happily women with cardiac disease sufficiently pronounced to cause grave anxiety are not likely to become pregnant. When pregnancy does occur, its premature interruption is common. This is ordinarily attributed to the fact that the uterine mucous membrane, like other mucous membranes, suffers from the venous stasis that is so often a part of the cardiac condition. One may form an idea of the condition of the membrane in these cases by observing the color of the lips in well-marked cyanosis. The same causes that produce the congestion may, of course, if sufficiently marked, result in hemorrhage, and this is sometimes observed. But there are other causes. The fœtus may die as the result of lack of oxygen, either directly owing to maternal cyanosis, or indirectly as the result of placental apoplexies due to high blood-pressure.

In my experience the unfavorable influence of pregnancy and labor upon cardiac disease has been much exaggerated. The mere fact that patients have a heart lesion does not usually make the prognosis unfavorable, provided compensation is good. In some cases patients with organic heart lesions, sufficiently pronounced to cause grave anxiety, undergo the ordeal of pregnancy and labor without appreciable disadvantage. I recall a case of aortic disease with pronounced anginal attacks in which the diagnosis was made by the late Dr. E. G. Janeway. The patient passed through labor without special incident. Naturally one cannot rely upon such a fortunate termination. Much myocardial degeneration is of course unfavorable, hence mitral lesions, other things being equal, are more dangerous than aortic. The mere fact that a well-marked cardiac murmur is present is of little significance as long as the pulse is good and there are no evidences of lack of compensation. According to Fabre valvular lesions of rheumatic origin are the most dangerous of all. This corresponds with my own observation.

The symptoms of cardiac disease in pregnancy are, in a general way, the same as in the non-pregnant condition. In cases of failing compensation in the latter part of pregnancy, distention and dyspnœa may be extreme. Albuminuria may be present and must be differentiated from the albuminuria of pregnancy. Embolism is more common than in the non-pregnant condition. Renal embolism with anuria has been noted, another condition which may simulate eclampsia. Hemiplegia, amaurosis and gangrene of the extremities have been observed.

During labor the danger is greatest during the expulsive stage, the period immediately preceding delivery. During the expulsive stage it is due not only to the great muscular exertion and to the congestion attendant upon the bearing-down efforts, but also to the rise in blood-pressure. The occurrence of serious symptoms shortly after delivery is usually attributed to the diminution of intra-abdominal pressure.

In fatal cases the patient may die suddenly and with little immediate

warning, or death may be preceded by an acute pulmonary œdema. The latter condition has been specially studied by Vinay. Its most characteristic symptom is a very copious and abundant expectoration—the *expectoration albumineuse* of the French writers. This is accompanied by dyspnœa and cyanosis, and by an abundance of moist râles.

Treatment.—The treatment of cardiac disease during pregnancy is both medical and obstetrical, and it is a great mistake to forget the medical treatment. If compensation is good, and there is no evidence of myocardial degeneration, active measures are not necessary, but the patient should be very carefully watched. The hygiene of pregnancy elsewhere described is to be carefully followed, and all kinds of mental and physical overstrain scrupulously avoided. Indigestion and constipation are especially to be feared in these cases and should be avoided as far as possible. Tepid baths and dry frictions are useful (Fabre). An abundance of fresh air is a *sine qua non* and oxygen inhalations are beneficial. The anæmia of early pregnancy should always be treated. The heart muscle is in need of the best blood that can be afforded. One should watch attentively for symptoms of failing compensation, and it is here even more important than in the non-pregnant condition, that such symptoms should be anticipated and treatment, *e.g.*, the administration of digitalis, begun at the earliest possible moment with the idea of forestalling dangerous developments.

If evidences of failing compensation appear in the early months the induction of abortion is to be considered, since under such circumstances it is highly unlikely that either mother or child will survive the prolongation of pregnancy, and the strain and probable accidents of labor. Ether oxygen, or nitrous oxide with oxygen, should be the anæsthetic, and an expert administrator should be secured if possible. The slower methods of procedure should be avoided.

During the latter months, however, the induction of labor is a much more serious matter, extending over hours and involving all the gravity of a major operation. It is better, therefore, to try medical treatment first, and resort to extreme measures only if this fails. If dyspnœa and cyanosis are marked some relief may be obtained by the immediate puncture of the membranes. Labor is then allowed to develop spontaneously. In cases of extreme urgency anterior vaginal hysterotomy is the operation of choice.

Prophylaxis.—In view of the bad effects that may result from the combination of cardiac disease and pregnancy, some writers have advised that marriage be forbidden in all cases. This is perhaps going too far. The mere presence of a heart murmur often means little or nothing. If, however, other evidences exist, and especially if there are any indications of decompensation, the dangers involved should be clearly explained to those most interested.

Treatment During Labor.—During the first stage interference is not usually indicated. Everything possible should be done to conserve the

strength of the patient. Excessive suffering may and should be mitigated by the use of morphine or pantopon. Suitable nourishment should not be forgotten. During the second stage expulsive efforts should be discouraged and the patient most narrowly watched. It is usually advised that labor be completed by forceps as soon as the cervix is fully dilated, but the shock of anæsthesia and hemorrhage that accompany a rapid forceps operation, and perhaps above all the sudden diminution of the intra-abdominal pressure, are of themselves highly dangerous in these cases. It is needless to say that these dangers are greatly increased if the operation is not done *lege artis*. Personally I believe that this procedure should be reserved for those cases in which the second stage is unduly prolonged or obviously injurious to the patient, or in which there is already evidence of decompensation. To operate simply because the patient has a heart murmur will, in the long run, do more harm than good. If, however, unfavorable symptoms, *e.g.*, weakness or irregularity of the pulse, dyspnœa, etc., are observed, delivery cannot be delayed.

How should delivery be accomplished? Obviously by whatever method can be performed most quickly and with the least danger to the mother. If the head is in the vagina the forceps may be applied. If the conditions are favorable for an easy version, this operation should be performed. If the cervix is undilated and rigid, anterior vaginal hysterotomy is the operation of choice. A few whiffs of ether oxygen should suffice for any of these operations. Cardiac cases should not be allowed to go beyond term. In this way prolonged and difficult deliveries are best avoided.

To obviate the ill effects of the sudden diminution of the intra-abdominal pressure, I am in the habit of applying a snug abdominal binder as soon as the fœtus is expelled, and without waiting for the expulsion of the placenta.

The danger is not always over with the completion of labor. The patient should be carefully watched for some hours. I recall a case in which cardiac dilatation occurred suddenly several hours after delivery.

For threatened or actual collapse camphor in oil, digalen and strophanthin are perhaps the best stimulants. Richter advises the intravenous injection of strophanthin. In the presence of pulmonary œdema a prompt and full venesection may afford relief. If the membranes are still intact they should be ruptured at once, no matter what the stage of labor.

Pituitrin, which markedly increases the blood-pressure, is contra-indicated in these cases.

Varicose veins of the lower limbs may be a source of great suffering during pregnancy. More than this they constitute a positive danger, since in case of rupture serious and even fatal hemorrhage may ensue. They probably predispose to phlebitis, thrombosis and embolism. They are much more amenable to treatment than is usually supposed, *and should always be treated*.

Every morning, before the patient arises, the leg, or, if necessary, the

leg and thigh, should be carefully bandaged, from the roots of the toes upward. The bandage should always be carried above the knee, and in the case of varices of the thigh it should be continued and held in position by means of a spica around the waist. It should be worn during the day and should not be removed until the patient retires for the night. Such a bandage can hardly be properly applied by the patient herself, but, in the absence of a trained nurse, any intelligent member of her family can be taught to do it for her. This simple treatment not only affords immediate relief but prevents the veins from becoming larger, a matter of considerable importance.

The patient should avoid long standing. Many women stand when they might as well sit, merely from force of habit. They should be taught that many things can be done sitting. Nothing should be worn that tends to constrict the waist. Constipation should be treated by the methods already described, and if the patient must go about she should be provided with a pad and bandage and instructed in its use. To lie down for an hour or two during the day with the feet elevated upon a pillow affords great relief.

Hemorrhoids, which of course are only varices of the rectum, may give much trouble in the latter months of pregnancy. Ice is on the whole the best local application. Anusol or opium suppositories may be used. An ointment of resorcin and oil of cade does much to allay external irritation. Much relief may be obtained by lying upon the back with the hips elevated upon a pillow, thus allowing the blood to gravitate away from the pelvic structures. Constipation should be treated by the methods already described.

Varices of the vulva may attain enormous proportions. Hæmatomata may thus be favored, occurring for the most part during operative delivery. Lacerations, which fortunately are not common, probably for the reason that these patients are usually multiparæ, may bleed severely.

Probably rupture of some internal varix, *e.g.*, of the broad ligament, may account for some mysterious cases of sudden death during pregnancy and labor which could not be diagnosed *in vivo*. DeLee has reported such cases.

Embolism is rare in pregnancy. Varicose veins and cardiac disease are predisposing causes. It is more common in the puerperium, as we shall see later.

Diseases of the Respiratory System

Asthma is an occasional complication of pregnancy. It is probably of neurotoxic origin, as it sometimes occurs in patients who never suffer from it at any other time. Those who are subject to asthmatic attacks suffer much more during pregnancy. Doubtless this is due in part to the deficient oxygen supply. Hirst has observed that complete change of air and scene constitutes the best treatment.

More common during pregnancy is emphysema. Abortion is relatively common. Here again oxygen deficiency serves to make the condition less bearable. According to the same writer the administration of oxygen, by counteracting the excess of carbon dioxide in the maternal blood, may prevent abortion. This is a suggestive and valuable observation.

Hæmoptysis may occur during pregnancy without phthisis or other organic disease. The cause is obscure but a knowledge of the fact may serve to lessen unnecessary anxiety. Perhaps this physiological venesection may serve to ward off an impending toxæmia.

COUGH IN GENERAL

This, especially if severe, paroxysmal and prolonged, and whether due to whooping cough, influenza, measles, or simply to a bronchitis or an ordinary cold, is a highly undesirable symptom during pregnancy, and by its mechanical action may cause hemorrhage, detachment of the placenta, and eventually the interruption of pregnancy. It should be suppressed as promptly and effectually as is consistent with the interests of the patient. Sedatives, *e.g.,* heroin or codeine, are usually indicated.

DYSPNŒA

As we have already seen, this is often present in slight degree, even in pregnancy approximately normal. Therefore in any affection in which oxygenation is interfered with, whether mechanically, as in capillary bronchitis, or by the destruction of the red corpuscles, as in profound sepsis, the vitality of the patient is rapidly lowered, and the accumulation of carbon dioxide in the blood leads to the interruption of pregnancy by causing uterine contractions. In pneumonia we see both conditions present and we find premature labor the rule.

Diseases of the Genito-Urinary Tract

ACUTE NEPHRITIS

Acute nephritis may develop during pregnancy, as at other times, but it is very rare. Of course, we have in the terminal stages of preëclamptic toxæmia and in eclampsia clinical symptoms and pathological lesions which can hardly be distinguished from those of acute nephritis, and if the physician is seeing his patient for the first time, the diagnosis may be difficult or impossible. If, however, he has been able to watch the case from the beginning, or if a complete history is accessible, he can usually make at least a presumptive diagnosis. In estimating the probabilities it is to be borne in mind that acute nephritis as a complication of pregnancy is much more infrequent than toxæmia or eclampsia, and that when it does occur there is usually a definite history of some one of the well-known causes of the condition, *e.g.,* scarlet fever, septic infection, bichloride or other poisoning, etc.

The prognosis is serious, of course, and the treatment practically the same as that of eclampsia.

CHRONIC NEPHRITIS

This formidable disease may, of course, originate during pregnancy, but in the great majority of cases the process antedates pregnancy. In other words, the nephritis does not complicate pregnancy, but pregnancy complicates the nephritis. The differentiation of the condition from pre-eclamptic toxæmia has been discussed in connection with the latter condition. The prognosis is bad, and the earlier in pregnancy the symptoms

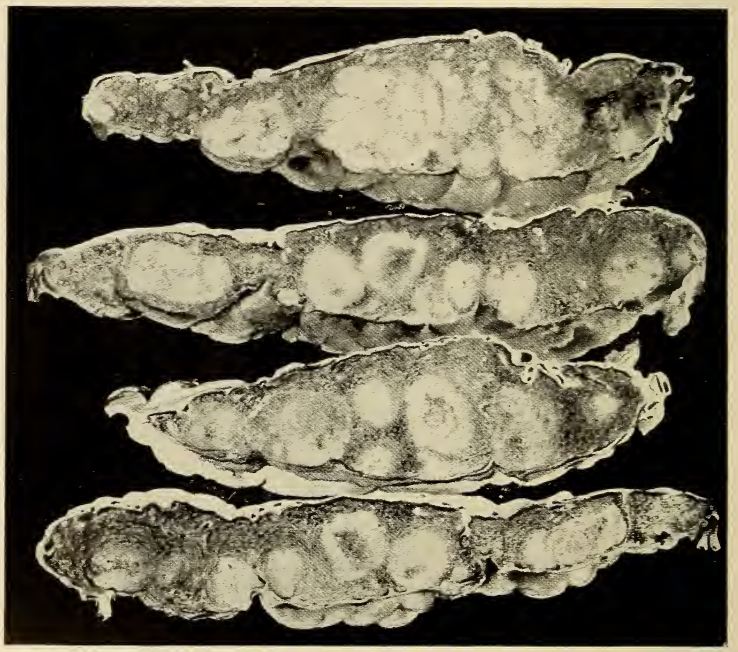

FIG. 177.—Case of albuminuria. White infarcts of placenta which has been cut in sections and placed so as to show the fetal aspect.

appear, the worse is the prospect. With well-marked evidences of nephritis in early pregnancy, it is very unlikely that either mother or child will survive its continuance until term. The extra work required of the kidneys is sufficient to account for the greatly increased danger to the mother, while hemorrhages, changes in the placental vessels, infarct formation, and maternal toxæmia help to account for the frequency of abortion, premature labor and still-birth.

Treatment.—The above facts seem to show that the termination of pregnancy is indicated in these cases, and this conclusion is confirmed

by clinical experience. If the patient is near the period of fetal viability and the disease is apparently stationary, one may wait a week or two in the hope of saving the fœtus. The greatest care should be taken to distinguish the condition from preëclamptic toxæmia. The latter is much more frequent, is essentially a condition of the latter months of pregnancy, occurs in patients without a previous history of nephritis, and is usually promptly benefited by treatment.

DIABETES

In speaking of the urine in pregnancy we noted the fact that it often contains sugar, but that in many cases this is milk sugar, the result of absorption from the breasts, and need cause no anxiety. It has been shown recently, however, that small amounts of sugar can be detected in the urine of every pregnant woman, and that sugar ingested during pregnancy soon appears in the urine. This accounts for the fact, long familiar to clinicians, that pregnant women bear sugar badly. Various reasons for this have been advanced. Personally, I am inclined to agree with Hofbauer that it is due to certain changes in the liver that interfere with its glycogenic function, and that accompany most, if not all, pregnancies.

Thus we see that the diagnosis of diabetes as a complication of pregnancy rests not altogether upon the presence of sugar in the urine, but, as before, upon the clinical symptoms. The presence of milk sugar means nothing and even the presence of moderate quantities of grape sugar may be simply the so-called " alimentary " or " physiological " glycosuria, much more common in pregnancy than at other times. Whenever the latter is present, however, the patient should be carefully watched, and suitable dietetic and other treatment instituted.

Fortunately true diabetes is rare in pregnancy. Williams was able to collect but sixty-six cases. In these, however, 50 per cent. of the mothers died; about one-half of these at or within two weeks of the time of labor, and the other half within two years. In nearly one-half of the cases pregnancy terminated in abortion or still-birth. This would seem to indicate that in these rare cases the artificial termination of pregnancy is indicated.

CYSTITIS

Cystitis is rare during pregnancy, but, unfortunately, not infrequent during the puerperium. During pregnancy it may be an extension of a gonorrhœa, or, like pyelitis, it may be the result of infection by the colon bacillus. In the puerperium it is usually caused by the careless or unnecessary use of the catheter. The symptoms are about the same as in the non-pregnant condition, but are far more likely to be followed by extension to the ureter, and pelvis of the kidney. In the puerperium it is most frequently caused by the careless or unnecessary use of the catheter. This will be discussed later.

Treatment.—It is important that a cystitis be cured as soon as possible, not only because of the attendant discomfort and exhaustion, but above all on account of the danger of the extension of infection to the ureter and pelvis of the kidney. My own preference is to irrigate the bladder with boric acid solution gr. xv to ℥i and then to leave from four to six ounces of a 5 per cent. solution of argyrol in the bladder until the next urination, after the manner of Hirst.

PYELITIS AND URETERITIS

An inflammation of the ureter and pelvis of the kidney is not uncommon during pregnancy and the puerperium, and is probably due to stretching or twisting of the ureters by the ascending uterus, or, after the fifth or sixth month, to the pressure of the uterus itself. Either of these factors may favor the transmission of an acute process, or may serve to light up a process previously existing. The organism most often at fault is the colon bacillus, though other organisms, notably the gonococcus, are often found. The inflammation of the ureter and pelvis of the kidney go together and are commonly known as pyelitis.

The affection may develop at any time, but is usually observed during the latter half of pregnancy, or early in the puerperium. It is seldom seen before the fifth or sixth month, *i.e.*, before the time when the pressure of the uterus begins to be felt. The right side is more often affected. This is explained by the usual right obliquity of the uterus, and by the fact that the presenting part usually occupies the right oblique diameter.

Clinical History.—The patient first complains of pain, which is usually referred to the right iliac region, and is described as radiating to the groin. Palpation, however, reveals tenderness in the right lumbar region rather than in front; a most important diagnostic sign.

The temperature is elevated. Sometimes it is continuous, with an evening rise which may be slight or marked. Again it may be intermittent and accompanied by well-marked chills, the clinical picture reminding one of that of malarial fever, for which indeed it has often been mistaken. The pulse varies with the temperature and presents no specially alarming features.

Micturition is frequent, as in cystitis, but there is not the burning and smarting characteristic of the latter condition. The urine contains albumen, pus and bacteria in abundance.

Internal examination shows that the enlarged and tender ureters can be palpated as they pass over the brim of the pelvis. If the patient has been delivered some degree of subinvolution will be noted.

In the puerperium the factor of pressure is removed, but in its place we have the increased frequency of cystitis from the incautious or unnecessary use of the catheter. Then, too, the possibility of its occurrence as part of a general blood infection is increased. The symptoms are much the same as in pregnancy but the affection assumes a somewhat more

acute character. The hectic type of fever reminds one of pyæmic infection.

The periods of chill followed by high fever doubtless correspond to the distention of the ureter with purulent urine. When the obstruction is relieved and the urine escapes, the temperature drops to normal, the pain disappears, and all the symptoms are relieved. The attendant congratulates himself upon the happy outcome, and all goes well for a day or two, when another chill and access of fever announce that the ureter is again obstructed.

Diagnosis.—With care this is not difficult. When the chills are severe and the fever intermittent the unwary may be led to make a diagnosis of malarial fever, or of pyæmic infection, and the fact that the pain is on the right side may lead the attendant to suspect appendicitis, or infection localized in the parametrium, but in either case the urinary findings and the lumbar tenderness should be sufficient. There is a strange tendency, however, for a man who sees this affection for the first time to mistake it for something else.

Prognosis.—The prognosis is good. The affection may be protracted, the temperature high, and all the symptoms well-marked, but final recovery is the rule. After the induction of labor, or after the completion of labor at term, there is usually a rapid subsidence of all the symptoms. In the puerperal cases the symptoms are more severe, but even here time usually suffices. Involvement of the kidney substance to such an extent that surgical interference becomes justified is very rare.

Treatment.—Prophylaxis is important. During pregnancy the external genitalia should be kept clean by frequent ablutions with soap and water; gonorrhœa, if present, should be promptly treated, and cystitis as well. In the puerperium, the use of the catheter should be avoided if possible, as advised in the section treating of the management of that period. If the use is unavoidable the most scrupulous care should be observed.

The patient should remain quietly in bed and drink large quantities of water and vichy or other alkaline fluid. The diet should be bland and unirritating, consisting chiefly of milk.

Among medicines urotropine enjoys a wide popularity. Five grains dissolved in a large glass of water may be given every four hours. Salol, helmitol, essence of turpentine and benzoate of soda have been used. Anodynes may be required for severe pain but should be used with discretion. It is important that the bowels be kept open and for this purpose a mild saline, *e.g.,* citrate of magnesia, is indicated.

An ice-bag may relieve the pain. If this fails hot applications, more agreeable to some patients, may be tried. Catheterization of the ureter and the injection of antiseptic solutions into the pelvis of the kidney have been advised but, unless in the hands of an expert urethroscopist, are likely to do more harm than good. Much safer and always easy to carry out is Pasteau's method of distention of the bladder, designed to excite peristalsis of the ureter and thus to facilitate drainage. The technic of this

method as given by Jeannin, who recommends it very highly, is as follows: The patient having urinated, 300 to 500 c.c. of tepid boric acid solution are introduced very slowly into the bladder, and the patient is encouraged to retain the solution for twenty minutes, when she is allowed to urinate a second time. The manœuvre may be repeated two or three times a day.

Hirst reports uniformly successful results with treatment by autogenous vaccines, and Polak gives similar testimony.

The induction of labor is seldom indicated. It is, however, occasionally justifiable when other methods have failed and the general condition of the mother is seriously compromised, especially in those rare cases in which both kidneys are involved.

In very rare cases nephrostomy (drainage) or nephrectomy (removal) of the kidney may be necessary.

Gastro-intestinal Disturbances

The gastro-intestinal system does not suffer as much as might be supposed during pregnancy. In fact, with the exception of the usual vomiting of pregnancy, which has nothing to do *per se* with the stomach, many women have a better appetite and digestion during pregnancy than at any other time. This is especially true of the second half of pregnancy. Nausea, vomiting and epigastric pain during the latter months are often symptoms of toxæmia, and should always lead to a careful urinalysis. Constipation is the most common and troublesome abnormality and this, together with other minor disturbances, is discussed in connection with the management of pregnancy. Of the toothache, gingivitis and salivation we have already spoken.

Diarrhœa occurring in pregnancy may be a conservative process. Examples of this are seen in the toxæmia and in the vomiting of pregnancy. Even in the severe type of vomiting one sometimes sees rapid improvement follow an attack of diarrhœa. Aside from cases of this kind, however, and once the attendant is satisfied that the bowel is free from irritating material, purging and intestinal cramps should be promptly arrested. During pregnancy they often cause severe shock, and they may be the cause of abortion or premature labor. In these cases a hypodermatic injection of morphine or pantopon not only relieves pain and diminishes shock but may prevent the interruption of pregnancy.

The oxidative functions of the liver are taxed during pregnancy and this leads to various disturbances. Simple catarrhal jaundice may occur as at other times, but has no special significance. Jaundice during pregnancy, however, is always a sinister symptom, as it may indicate the beginning of the liver degeneration which accompanies eclampsia and pernicious vomiting and characterizes acute yellow atrophy. Gall-stones are more frequent during pregnancy and the puerperium. No satisfactory explanation for this fact has yet been adduced. According to

Williams enteroptosis is often benefited by pregnancy, the descending viscera being held in position. The same writer quotes Maillart as affirming that the improvement may sometimes be made permanent by the use of a moderately tight binder during the puerperium and a well-fitting abdominal supporter afterward. This is important, if true.

APPENDICITIS

This is easily diagnosed during the early months, and it is probably better for the mother to operate at once, especially if she has had an attack before. The operator should remember, however, that abortion is common after appendectomies, and the patient or those most interested should be informed of this fact. To prevent abortion, if possible, it is wise to avoid all handling of the uterus and ovaries and to administer morphine hypodermatically immediately after the operation.

In the latter half of pregnancy conditions are unfavorable both for diagnosis and operative technic. It may be difficult to secure access to the field of operation. The presence of the pregnant uterus embarrasses the operator, and should labor supervene the retraction and descent of the uterus after delivery may result in rupture of an abscess, should one be present. For these reasons, unless the immediate performance of the operation is distinctly indicated, it should be deferred until after delivery.

Diseases of the Nervous System

GENERAL PRURITUS

Though often classed as a cutaneous disease this is in all probability a neurosis, with perhaps a toxic substratum. Fortunately it is not common. The suffering of the patient may be extreme, especially at night, sleep becoming impossible. I recall a case in which after many sleepless nights the patient became hysterical and almost maniacal. Sedatives and hypnotics were without effect and I was obliged to induce labor. Happily the child was viable and survived.

Remedies to reduce peripheral irritation and induce sleep, *e.g.*, chloral and the bromides, are indicated. Psychical treatment has been advised but is of little service. Hydrotherapeusis offers more hope of relief.

LOCAL PRURITUS

This affects chiefly the vulva and may be the source of great annoyance. In some cases it appears to be of neurotic origin but in others it can be accounted for by an irritating vaginal discharge or by diabetes. I have found an ointment composed of resorcin and oil of cade very useful in these cases. Gonorrhœa should be treated as already described. Cleansing alkaline douches may be helpful but should be used with caution on account of the danger of bringing on labor.

NEURITIS

This is not uncommon during pregnancy. The symptoms are much the same as in the non-pregnant condition. The so-called gestational neuralgias, *e.g.*, the toothache so often observed and the facial neuralgia of which these patients complain, are probably closely allied to this condition. It is fashionable at present to attribute these pains to some unexplained toxæmia, and doubtless this is the cause in many cases, *e.g.*, in the polyneuritis that accompanies the vomiting of pregnancy. They are, however, more common in early pregnancy and in anæmic subjects. The headache of preëclamptic toxæmia occurs in the latter half of pregnancy and is seldom unilateral. Neuralgic pains in the legs and thighs, due to the pressure of the child's head upon the nerves that pass over the brim of the pelvis, are common during the latter weeks of pregnancy, especially, according to my observation, in the case of very large children. The non-indicated or unskilful use of the forceps may cause neuritis or even paralysis of long duration. Eventual recovery, however, is the rule. Neuritis has been observed in connection with pelvic exudations and with femoral phlebitis. In these cases pressure would seem to be the determining factor. There is a form of neuritis which occurs during the lying-in period and involves especially the sciatic nerve, though it may affect the arms or trunk. There may be considerable inflammation and œdema of the affected limb. This form may occur in cases in which there has been no traumatism whatever, a point emphasized by Garrigues, and very important from a medicolegal stand-point. Not every case of neuritis or paralysis that follows delivery is the fault of the doctor.

Analogous to the "nerve pains" of pregnancy are the transient paralyses so often observed. These may involve any part of the body, even the nerves of special sense. Loss of vision does not always mean impending eclampsia, though it should always excite the keenest attention of the physician and lead to a careful study of all the symptoms, including of course urinalysis. Sometimes it is due to anæmia of the retina. Again the condition may be one of hysterical amblyopia. In some cases but one eye is affected. Deafness may occur and involve one or both sides. Hæmiplegia or paraplegia may occur, but it is not usually organic, does not affect the progress of labor, and disappears during the puerperium. Even organic and incurable paraplegia, as elsewhere noted, does not necessarily prevent or delay parturition.

Neuralgia of the muscles of the abdominal wall, the result of distention by the growing uterus, is not uncommon. There is a tradition among the laity that this is benefited by anointing the abdomen with oil. The practice seems to afford relief in some cases and is at all events quite harmless.

The psychoses of pregnancy, labor and the puerperium will be discussed in the concluding chapter.

Cutaneous Diseases

Pregnancy, *per se*, seems to have little connection with diseases of the skin. Pruritus as we have seen is probably neurotic or toxic in origin. Chloasma, already discussed, is undoubtedly of gestational origin and there are two other affections of which the same may be said.

Herpes, appearing upon the extremities, more rarely upon the face and chest, is relatively common in pregnancy and is technically known as herpes gestationis. As in the case of the familiar herpes zoster it follows the course of the nerves.

Impetigo herpetiformis is seldom seen in this country. Inflammatory areas are surmounted by pustules which, at first separate, become confluent later. The eruption occurs in the groins and upon the trunk, less often upon the limbs, seldom upon the face. The patches show a tendency to heal at the centre and extend at the periphery. The affection is attended by chills, high temperature, and general prostration. The cause is still a matter of speculation. The prognosis is bad. Mortality 75 or 80 per cent. Mayer reports success in three cases from the injection of 20 c.c. of the blood serum of a pregnant woman.

Surgical Operations in Pregnancy

Much has been said and written upon this subject. In a general way one may say that the old fear of operations during pregnancy has disappeared and that it is now recognized that if an operation is distinctly indicated it is to be performed in pregnancy as at other times. This statement, however, requires certain modifications. We have already seen how in certain cases, *e.g.*, in appendicitis and in certain cases of ovarian tumor complicating advanced pregnancy, operation is made much more difficult by the presence of the enlarged uterus and if not imperative is better postponed until after delivery.

Then again certain operations, *e.g.*, the two just mentioned, are peculiarly likely to be followed by abortion, and measures of prevention already described should never be omitted. This is most important, though seldom emphasized.

During the operation the operator should never forget that he has under his care two patients. The duration of the anæsthesia should be strictly limited and the amount minimized. Ether should be given and there should be a large admixture of oxygen. Of dental procedures I have already spoken in connection with the management of pregnancy.

CHAPTER XV

THE PREMATURE INTERRUPTION OF PREGNANCY

When pregnancy is interrupted before the period of viability of the fœtus, *i.e.*, approximately, before the end of the sixth month, the process is termed an abortion. When it is interrupted between the period of viability and the normal termination of pregnancy, it is called premature labor. Its termination during the second trimester was formerly known as a miscarriage, but the term has been abandoned as without scientific meaning. It may be used, however, in speaking with the patient or her family, since the term abortion is so often associated with criminal practices that it has acquired a sinister and offensive sound.

Etiology.—To mention here every illness or accident that might conceivably be the cause of abortion is manifestly impracticable. We may, however, group the causes as follows: 1. Maternal causes, which may be either general or local; 2. fetal causes; 3. incidental causes; 4. criminality.

Among the general maternal causes syphilis, as we know, takes the lead. Here the constitutional disease produces changes in the placenta that lead to the death and final expulsion of the fœtus, and the immediate cause of abortion is after all a local one. In the acute infectious diseases the process is analogous. For example, in typhoid the bacillus may find its way to the fœtus, which contracts the disease, dies, and is finally expelled. More commonly the fœtus is destroyed by the toxins of the disease. In nephritis, and other conditions of high arterial tension, placental apoplexies may interfere with the exchange between mother and fœtus, causing the death of the latter. Cyanosis occurring in the course of cardiac or renal disease may result in the death of the fœtus from lack of oxygen; or the high accumulation of carbon dioxide in the maternal blood may stimulate the uterus to contract. High temperature also stimulates the uterus to contract, especially when it comes on suddenly as in scarlet fever. In the last two instances the uterus contracts as a result of external causes. In the instance first mentioned it contracts as a result of the death of the fœtus. In some cases we may have more than one factor. For example, in pneumonia, in which premature labor is the rule, we may have toxins in the maternal blood, cyanosis, and high fever coming on suddenly.

The reader may well ask here, "Why does the death of the fœtus result in its expulsion?" This question has not as yet been satisfactorily answered. To say that the ovum has become a foreign body sounds plausible but explains nothing. Why the uterus contracts when the fœtus dies is as much a riddle as why it expands when the fœtus lives. However, the fact remains.

Then again certain symptoms of disease tend to excite uterine contractions by mechanical irritation. Examples of these symptoms are coughing, vomiting, straining, convulsive movements, etc.

Local Changes.—Of the local changes which lead to abortion endometritis is by all odds the most frequent. Here again it is the death of the fœtus that affords the impulse to uterine contraction. In cases of retroflexion, prolapse and other displacements the abortion is attributed to the displacement, but this is more often due to the accompanying endometritis. This also is true of tumors which do not encroach upon the uterine cavity. In the case of the latter, however, and in the case of uterine malformations it is easy to see how the premature distention, due to the insufficient size of the uterine cavity, leads to vigorous contractions and the final expulsion of the uterine contents. In the same way it is not difficult to understand how the stretching of old adhesions, the result of some inflammatory process, may afford the reflex impulse to similar contractions.

Fetal and Placental Causes.—Of those causes which have to do with the ovum primarily, but not necessarily with the death of the fœtus, faulty insertion of the placenta is the most common. It is doubtless the unrecognized cause of many early abortions. Multiple and molar pregnancy are other examples.

Incidental Causes.—There are certain accidental causes which are best classified by saying that they do not belong to any particular class. Among these are any severe mental or physical exertion, various drugs, long railroad journeys, driving over rough roads, bicycling, blows, shocks, various kinds of traumatism, surgical operations, etc.

Criminality.—Every physician soon learns that a large proportion of abortions are premeditated, intentional, and without justification. This nefarious work is performed in our large cities by "quack" doctors, by many midwives, and very often by the patient herself. It is unfortunately true that some who aspire to the reputation of being engaged in the honorable practice of medicine are not overscrupulous in this matter. It often happens that the perpetrator of the crime, having initiated the process of abortion, lacks the courage or the knowledge to finish his work. The abortion has become inevitable and the remainder of the process must be supervised by some physician engaged in legitimate practice. These "incomplete abortions" soon become familiar to the ambulance surgeon and the young practitioner. Sometimes the ovum has been punctured but the bulk remains *in utero,* or, again, the fœtus has been expelled and the placenta remains.

Paternal Causes.—We hear sometimes of paternal causes. If the husband has syphilis and transmits the disease to his wife, or child, abortion may of course result, but here the father is, strictly speaking, the occasion, rather than the cause, of the abortion. Again, we know that some men are sterile, and it has been assumed that certain men may

procreate an ovum that has not the power of survival. This, however, remains to be proven.

Irritable Uterus.—Some women are prone to abort upon slight occasion, or for no cause discoverable by superficial examination. Such patients are often said to have the "abortion habit" or to be the victims of what is sometimes called "irritable uterus." It is probable that in a large proportion of these cases a more thorough examination would reveal some undiscovered cause, *e.g.,* some chronic constitutional disease, or a chronic endometritis.

Mechanism.—In labor at term the fœtus is so large that it constitutes the chief obstacle to delivery. All the problems of the mechanism of labor centre about the position and movements of the fœtus. This is true though in a lesser degree of the last five months. In the first four months, however, it is the decidua or the placenta that constitutes the bulk of the ovum. *An appreciation of this fact is necessary if one would understand the mechanism or the treatment of abortion.*

In the first two months the thick and very friable decidua is gradually separated from the uterine wall by the uterine contractions and after sufficient dilatation of the cervix the ovum is expelled entire. The tiny embryo, lost in the mass of decidua, usually passes unnoticed. The process requires much less time in multiparæ than in primiparæ since the resistance of the external os has been overcome in a preceding labor. In a primipara, however, the external os may offer a stout resistance and the process be long and painful, lasting for hours or even days. In certain cases the ovum may be arrested in the cervix, the internal os recontracting to some extent and the dilatation of the external os being delayed. The ovum remains imprisoned in the now spindle-shaped cervical canal; the so-called "cervical abortion." This also may continue for a long time. In these cases we speak of the expulsion of an "intact ovum." It should be remembered, however, that the uterine decidua is retained. This fact, as we shall see presently, has an important bearing upon the treatment.

In the first two months then, the expulsion of the intact ovum is the rule. To this rule, however, there are many exceptions. The sac may be ruptured before the cervix has become dilated or the decidua has become separated from the uterine wall. This is the case in a large proportion of criminal abortions in which the puncture of the membranes is often the first step.

In the first two to two and one-half months the decidua constitutes the great bulk of the ovum and the principal danger to be feared is the retention of decidua. Abortion at this stage is called by the French, ovular abortion. I am in the habit of calling it decidual abortion, a name which at once describes the condition and suggests the treatment (Fig. 178).

At about two and one-half months placental formation is complete, the amnion and chorion are easily separated and decidual atrophy has

become marked. The fœtus, though more noticeable than before, is relatively small but the placenta has become relatively large and now constitutes the great bulk of the ovum. The principal complication to be feared is retention of the placenta. Obviously the best name for this stage is that of placental abortion. Here there is usually little chance of the escape of an intact ovum.

The presenting part of the ovum usually ruptures, the fœtus is expelled, carrying with it the decidua reflex, while the placenta and decidua vera are retained. More rarely the fœtus is expelled alone, the placenta and mem-

Fig. 178.—Decidual abortion.

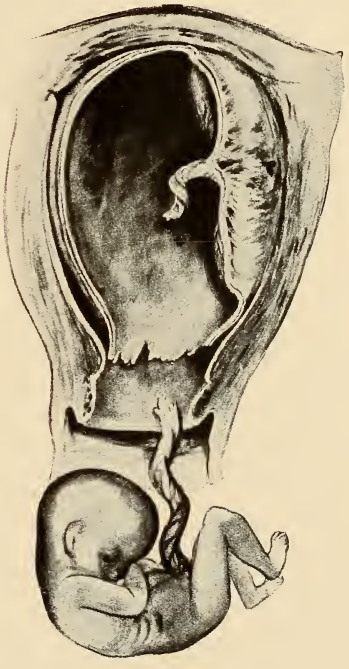

Fig. 179.—Placental abortion.

branes remaining *in utero;* or the physician may find on his arrival that the fœtus, placenta and membranes have all been extruded (Fig. 179).

In the fifth and sixth months the fœtus has grown so large that it fills the greater part of the uterine cavity and the so-called abortion has become a veritable labor in miniature. There is no longer any special danger of retention, either of placenta or decidua. The fœtus, though not large enough to constitute a serious obstacle to delivery, plays the principal rôle. When the fœtus has been delivered the rest is usually easy.

I earnestly advise the student to learn these simple facts with reference to the classification and mechanism of abortions, believing that they will

do much to clarify a subject which, for some reason, many men seem never to master at all.

How shall we divide abortions clinically? Here the old classification is satisfactory. Every abortion of whatever variety is threatened, inevitable, or incomplete. The first two terms explain themselves, the third has already been explained.

Clinical History.—The chief symptoms are pain and hemorrhage. The "pains" are recurrent, like those of labor, but more irregular. In primiparæ they are often quite severe, and when the ovum is arrested in the cervix the suffering may be constant and extreme. Once the bulk of the ovum has escaped into the vagina the pain suddenly ceases. More or less hemorrhage usually continues, however, until the uterus is empty, especially in cases of retained placenta.

Vaginal examination shows enlargement of the uterus corresponding to the probable period of pregnancy. Some men forget all about this. The large boggy anteverted body of the *corpus uteri* is easily felt in the anterior *cul se sac.* It is not unusual for patients even in the midst of an abortion to deny the fact of pregnancy. Cervical dilatation may not have progressed far enough to permit the introduction of the finger. If in this case the examiner finds that the cervico-uterine angle has been effaced, *i.e.,* that the cervix is no longer a cylinder but a cone, the junction of the cervix and the body of the uterus not being felt, there is little doubt that an abortion is well in progress. This valuable sign, easy to elicit and of great value, should be carefully studied by the beginner in obstetrics.

Now and then in the case of a primipara the ovum remains for hours in the long cervical canal from which, owing to the resistance of the external os, it cannot escape. It is this resistance, already overcome in the case of a woman who has borne a child, that makes an abortion in a primipara such a tedious and painful affair.

At a later stage the finger can be passed through the cervix and made to touch some part of the ovum, or if this has been expelled, to palpate the interior of the uterus and to recognize placental tissue if present.

Having determined that the patient has some symptoms of abortion the question at once arises, Is abortion inevitable? This is an important question because the treatment employed in one case is radically different from that employed in the other. If the abortion can be prevented, it is the duty of the physician to prevent it; if it is inevitable the process should be hastened as much as is consistent with the safety of the mother.

If the cervical canal has become effaced, or if the evidences of cervical abortion are present, or if the finger passed through the cervix recognizes some part of the ovum in the region of the external os, abortion is to be regarded as inevitable.

If with severe and recurring pains there is free hemorrhage abortion is to be regarded as almost certain.

On the other hand, if pain and hemorrhage are slight, and, above all, if the canal of the cervix is preserved in its entire length, and its point of junction with the *corpus uteri* is plainly appreciable, the case is to be regarded as a threatened abortion and every effort made to arrest its progress.

Diagnosis.—There can hardly be any difficulty in diagnosis provided we are certain of the existence of pregnancy. This is to be determined by the signs already given. Of course the history is valuable if it is reliable. Unfortunately one not infrequently meets cases in which all history of pregnancy is denied, and this even though the patient presents unmistakable evidences of abortion in active progress.

A fibrous polypus in process of extrusion is a possible source of error since there is dilatation of the cervix and a foreign body may be felt. I have known two or three instances in which this curious mistake was made.

One may be for a time uncertain whether a profuse and painful menstruation may not be an abortion at four weeks. If subinvolution is present the uterus will be somewhat enlarged, simulating the uterus of early pregnancy. Here one may be obliged to wait for a day or two. If the finger can be passed through the cervix something more than mere menstruation must be present.

Whenever the finger can feel some part of the ovum through the external os the diagnosis is easy.

All clots or other uterine débris should be carefully examined under water and the patient should be instructed to save whatever is passed from the vagina. Unfortunately, it is the rule that everything has been carefully disposed of before the arrival of the physician.

The beginner should remember that, in threatened or actual abortion, the blood is bright red. A discharge of brownish-red fluid is a common symptom of decidual endometritis and is often compatible with the continuance of pregnancy.

Tubal abortion has often been mistaken for ordinary abortion. Here again the difference in the treatment makes a mistake in diagnosis a very serious matter. Hence the following cardinal rule, *In every real or suspected abortion the condition of the adnexa should be determined by careful bimanual examination.*

By the observance of this rule the attendant not only guards against the danger of overlooking a tubal abortion, but against the danger of neglecting the presence of an infectious process in the parametrium.

Treatment.—The treatment of abortion is either preventive or curative. The preventive treatment should on no account be forgotten.

Syphilis, the most common cause, should be treated by the methods already described. Nor should the treatment of the husband if necessary be forgotten. Morbid constitutional states, and especially anæmia from

whatever cause, should be treated. In certain doubtful and ill-defined conditions complete change of air and scene is attended by satisfactory results.

Local disabilities should receive expert attention. Endometritis should receive appropriate treatment. It is a matter of common experience that a thorough dilatation and curettage are often followed by conception in women who have been married for several years without conceiving. I have learned to have little patience with prolonged treatment by tampons, etc. Cervical tears should be repaired, uterine malpositions corrected, etc.

In a word, the patient should receive such local treatment as she may require, and should then be placed in the best possible general condition.

If conception happily follows she should, as far as possible, avoid all the causes of abortion already mentioned.

Patients predisposed to abortion should avoid all physical, mental and emotional strain and refrain from sexual intercourse, especially at periods corresponding to the menstrual epochs. They should carefully guard against constipation, but should avoid all drastic cathartics, especially the popular castor oil, which has a peculiar tendency to excite uterine contractions. The fluidextract of viburnum prunifolium, one-half drachm four times a day, seems to be useful as a uterine sedative. Beginning the employment of this remedy with some skepticism I have become convinced of its usefulness.

If slight pain and discharge appear, the patient should be put to bed and kept quiet by the use of morphia in full doses. Its action is deepened and prolonged by combining it with hyoscine or the bromides. Viburnum may be given at the same time, but in my opinion it is a mistake to defer its use until symptoms of threatened abortion appear. When a predisposition to abortion exists it should be used to *prevent the appearance* of such symptoms. The patient should be kept quiet and the treatment only gradually discontinued. The bowels should be kept open by simple enemata or by mild laxatives like the magnesium citrate. No douches, no tampons, no ice-bags. All these things tend to cause uterine contractions. If the bleeding is so severe as to require them, there is little hope of arresting the process and the case is to be treated as one of inevitable abortion. The patient should be kept under careful observation during the remainder of her pregnancy.

While there is general agreement as to the preventive treatment of abortion, the curative treatment still remains a *questio vexata.* Many students of the subject, myself included, have been perplexed and embarrassed by the varying and conflicting views of teachers and writers. After considerable experience I have settled upon a method of treatment which I do not hesitate to recommend to my readers. It is based upon anatomical conditions and has given such good results in my hands that I would be very loath to discard or materially modify it.

In the first place there are two dangers to be combated: hemorrhage

and infection. The latter is the more serious one and is to be met, here as elsewhere, by a careful observance of the rules of asepsis. Modifications of these rules adapted to the treatment of abortion will be discussed as we go on. It is highly desirable to limit the amount of hemorrhage to the minimum. A fatal result from hemorrhage in these cases is not common, but such a result is by no means impossible and not infrequently the patient loses so much blood that her convalescence is prolonged and her future health impaired.

Unlike normal labor abortion is an unnatural process. Nature, interrupted in her work, has not found opportunity to provide for the prompt and complete emptying of the uterus. Retention of portions of the ovum is a predisposing cause of infection and a direct cause of hemorrhage. The fœtus is of course not viable and can therefore be disregarded.

The indication then in every inevitable abortion is to empty the uterus as soon as this can be done without injury to the mother. Not, as many seem to imagine, at any cost or at whatever sacrifice.

Recalling that, as we have just seen, the contents of the uterus and the mechanism of their expulsion differ at different periods of pregnancy, it is obvious that the treatment will also differ.

If the attendant is convinced that the case is one of inevitable abortion the emptying of the uterus is indicated. How shall it be accomplished? *This depends upon the condition of the cervix.*

If the cervix is sufficiently dilated uterine contents should be removed with the finger. During the first two months the introduction of one finger is sufficient. I have read the statement that as a necessary preliminary the cervix should be dilated until it admits two fingers. If this advice is followed in all cases many bad cervical tears will result. During the first two or two and one-half months one finger is sufficient.

Technic.—The patient should be in the dorsal position with bladder and rectum empty. The external genitalia should be carefully cleansed with soap and water and lysol solution. Preliminary douching is in my experience quite unnecessary.

The operator now proceeds to the digital removal of the uterine contents. How is this to be accomplished? The text-books tell us to pass the finger up to one cornu of the uterus, then carry it across to the other and then downward, sweeping the uterine contents before it. This sounds well but many an operator has discovered that, without further explanation, it is difficult or even impossible. Indeed, if the uterus is in a condition of marked anteflexion, as it usually is at this time, and is allowed to remain so, the procedure advised is a mechanical impossibility. I have usually succeeded in the following manner: The finger passed through the internal os makes traction upon the anterior cervical lip, thus retroverting the uterus and bringing it into line with the vagina (Fig. 180). The external hand now makes strong pressure over the fundus, pushing the uterus down over the finger, when the bulk of the ovum can usually be removed in the

manner described. This simple manœuvre, which is the product of my own experience and which has doubtless occurred to many others, I have never seen illustrated or described.

All large fragments of ovum and placenta are to be removed by the finger, which then palpates the uterine interior in order to assure the examiner that the bulk of the uterine contents has been removed.

Do not try to do this with the curette. Certainly not after the first month. It is unsafe and ineffectual. Some men think they can tell what is in the uterus with the curette, but this is a delusive belief. Large masses

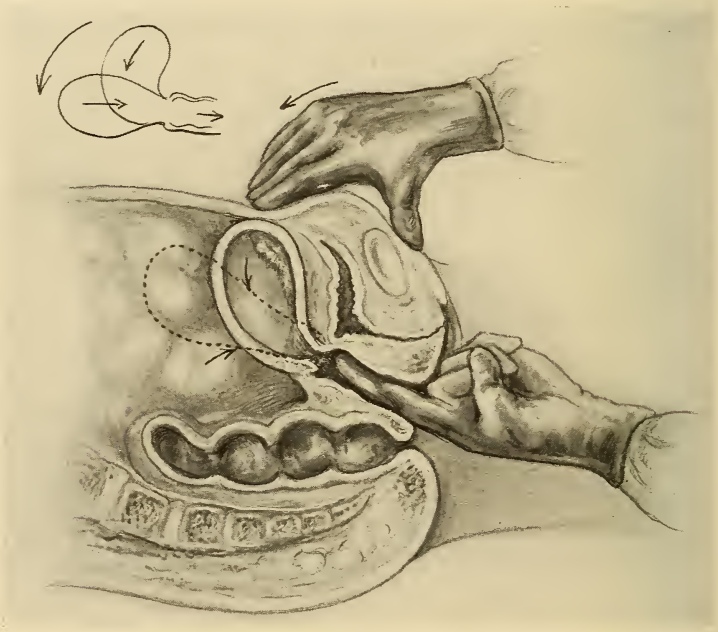

Fig. 180.—Showing manner of bringing uterus in line with vagina.

of placenta have often been removed after this kind of curettage, not to speak of cases in which the uterus has been perforated.

But the educated finger can tell. Whenever opportunity offers the beginner should practise the manœuvre under the direction of a more experienced colleague in order that he may not be embarrassed at his first case. Now and then the canal of the cervix has not been obliterated and resists all efforts at dilatation. The fingers can feel, but not grasp, the placental bulk. Under these circumstances the cautious use of the placental forceps is permissible. In order to avoid the danger of seizing the uterine wall the instrument should not be carried far above the internal os. Any attempt to push it to the fundus is dangerous. During its employment it should be guided and controlled by the finger.

After the separation of the placenta there is always left a roughened surface at the placental site. This, of course, should not be made the subject of curettage or of attempts at removal. It is highly important that the beginner be made acquainted with this fact, but a review of the text-books shows that it is mentioned by only one other.

The whole procedure may be made much easier by passing the entire hand into the vagina, and if the operator has a small hand and the patient is a multipara with lax and capacious vagina this may be done, but under ordinary circumstances it is a barbarous procedure and capable of producing serious laceration.

FIG. 181.—Curette, natural size.

Should the curette be used, and, if so, when, and in what cases? With reference to this point there is much confusion and much difference of opinion. My own custom is as follows: If pregnancy is of less than three months' duration I use the sharp or half-sharp curette carefully but thoroughly. This is not always necessary, but in the great majority of cases gives the best results. While Bumm and Winter have shown that the retained decidua vera may be restored to normal mucous membrane, this is the exception, especially after the first month. The retained decidua keeps up the bleeding and predisposes to infection. Some writers, while using the curette, would limit its use to the first two or two and one-half months. I have been accustomed to treat all cases in which pregnancy is apparently of less than three months' duration as belonging to the decidual period, and believe this to be the safest course. We never know the exact date of conception or the precise degree of embryonal development.

I am convinced that this treatment not only arrests hemorrhage, minimizes the danger of infection, and materially shortens the period of convalescence, but prevents the endometritis and menorrhagia so common after early abortions.

The curette should be of good size. Not smaller than that shown in Fig. 181. For general use the half-sharp curette is the best. A very small instrument is inefficient and dangerous. It may penetrate a sinus, or gouge or even penetrate the uterine wall. Moreover, the larger instrument can be located after it enters the uterus.

The curette should be held with the thumb and finger and carried very gently to the fundus. The down stroke may be moderately firm. The operator should go over the ground systematically; first the anterior wall, then

the sides and the posterior wall. The cornua should not be neglected. Before every curettage the position of the uterus should be carefully determined. Fig. 182 shows what might result from neglect of this precaution.

Every physician who does much obstetric work should be provided with a suitable curette and should know how to use it; but this knowledge cannot be obtained from books. Every prospective obstetrician should perform the operation at least once or twice under suitable direction and control as part of his regular preparation for practice.

I am in the habit of giving a single intra-uterine douche of hot salt solution after the uterus has been emptied, whether by the finger or curette. In my experience this serves to wash out any decidual or placental

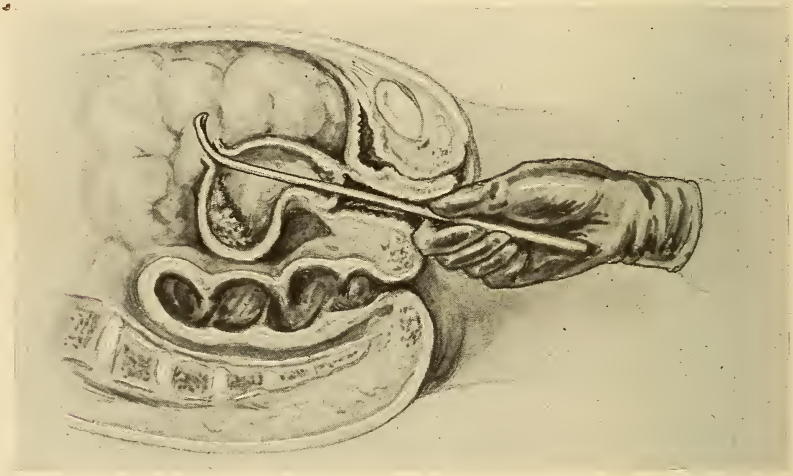

Fig. 182.—Perforation of retroflexed uterus.

débris that may remain, stops bleeding, and secures prompt and firm uterine contraction. It is not absolutely necessary, however, and it should not be repeated.

Draining the uterus with gauze, *i.e.,* leaving a strip of gauze in the uterus with one end projecting into the vagina, is a common and I believe a very pernicious practice, favoring as it does the transmission of infection from the vagina to the uterus. Indeed the conditions thus created are very similar to those which obtain when the membranes are retained and left hanging from the cervix. Drainage is not needed in these cases. As Polak has well said, a uterus in normal position will drain itself.

Nor is it usually necessary to pack the uterus. If the uterus is empty the bleeding will cease spontaneously. If the bleeding continues it will usually be found that the uterus was not properly emptied. Very rarely, however, a lax uterus will bleed even though empty. In this case it should

be packed with gauze, as described in the section on the treatment of postpartum hemorrhage. I have met but one case in which this was necessary.

After the third month there is little or no use for the curette, certainly not for the sharp curette. The decidua vera has now atrophied and it is placental retention that is to be feared. The finger and occasionally the placental forceps are used.

After the fourth or fifth month the secundines are expelled as in normal labor and no special precautions are necessary.

Up to this time we have been considering cases in which the cervix admits one or two fingers. But suppose that the cervix is only slightly dilated and the hemorrhage profuse. This is a case for the tampon. A sterilized gauze bandage is as good as anything for this purpose. The cervix and lower uterine segment should first be packed and then the vagina, and the whole should be held in place by a T-bandage. Instrumental dilatation is unnecessary and dangerous, as I have tried to show in the chapter on the induction of abortion, which the reader is advised to review in connection with this subject. The tampon may be removed in about twelve hours, when the cervix will usually be found well dilated. The uterus is then emptied as already described.

Not infrequently the patient has lost a large quantity of blood before the physician's arrival. In these cases extreme care is indicated. If an anæsthetic becomes necessary ether or nitrous oxide should be used. The treatment of acute anæmia, as detailed in the chapter on postpartum hemorrhage, should be carried out in every detail and in particular the venous or subcutaneous infusion of salt solution should not be too long delayed. It is not common for a patient to die from hemorrhage under these circumstances, but it is by no means impossible.

After-treatment.—The patient should remain quietly in bed for a week or ten days. Too early getting up is a fruitful source of subinvolution and subsequent uterine disease. No douches should be given. Scrupulous external cleanliness is sufficient. An ice-bag over the uterus for the first few days is a wise precaution. It serves to promote uterine contraction, allays pain and soreness, and possibly helps to inhibit bacterial development. Small doses of ergot, ten or fifteen minims every three or four hours, are also useful. A favorite prescription of mine at this time is ergot and hydrastis, ten minims three or four times a day.

Let me briefly summarize what I believe to be the most important facts.

When the cervix will admit the finger the latter is to be used for the removal of all large masses. The cautious use of the placental forceps is allowable.

If dilatation of the cervix is necessary the tampon is to be preferred to the steel dilators, except in cases of great emergency.

If pregnancy is of less than three months' duration it is wise to use the curette after the uterus has been emptied by the finger. After this the curette is not indicated. The curette should not be used in septic cases.

No gauze should be left in the uterus or vagina after delivery except in case of hemorrhage from a relaxed uterus.

No bichloride, carbolic or other poisonous solution, should be used for intra-uterine irrigation after delivery.

Ether is to be preferred to chloroform, especially when there has been much bleeding.

Rubber gloves should be worn and changed when necessary and every effort made to insure rigid asepsis.

The ice-bag and ergot are valuable to promote involution.

Mention must here be made of several curious phenomena all depending upon the retention, *in utero*, of certain products of conception. Of

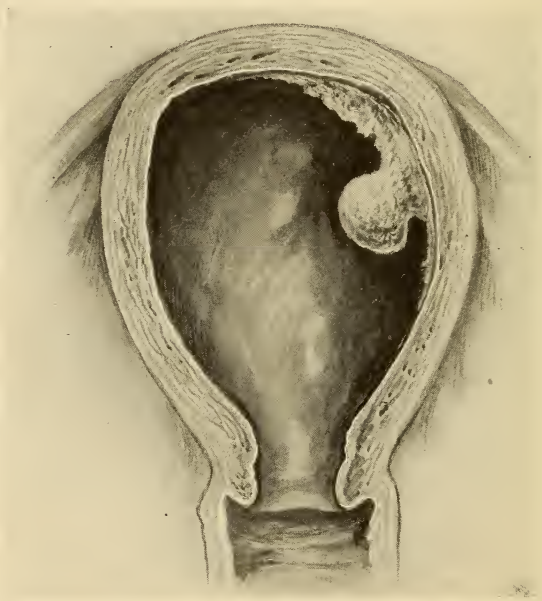

FIG. 183.—Thrombus at placental site, simulating polypus.

these the most remarkable is that which is known as missed abortion. This phenomenon was made much of by the older writers and was probably much more common than it has been since the prompt emptying of the uterus has become a matter of routine.

The prompt success of modern methods of treatment has led us to think of abortion as a process that always goes on to completion. This, however, is not the case. The uterus does not always empty itself. The contractions may cease after a time, the cervix recontract, and the product of conception be retained. If, in the meantime, hemorrhage takes place into the ovum itself we have an accumulation of blood between the vera and reflexa, and between the amnion and chorion. The resulting mass

made up of ovum and blood clot may be retained for some weeks, or even months. At first the mass is red and is called a blood mole. Later it becomes lighter in color and is then known as a flesh mole. These moles are sometimes retained for months and the fœtus may become macerated, mummified, or even petrified, the amniotic fluid being absorbed meanwhile. The petrified fœtus or lithopædion, as it is called, is the result of the deposition of lime salts and is very rare in ordinary pregnancy, though it occurs somewhat more frequently in extra-uterine pregnancy.

When the placenta is retained its rough surface favors the coagulation of the blood which comes into contact with it and the result may be a thrombus, which gradually increases in size until it fills the uterine cavity and projects from the cervix like a polypus; whence the name placental polypus (Fig. 183).

CHAPTER XVI

EXTRA-UTERINE PREGNANCY

The subject of extra-uterine pregnancy occupies the borderland between obstetrics and gynæcology. It is a remarkable fact that many writers of obstetric text-books, while devoting scant space to, and giving little information about, the most important and the most frequently performed of the purely obstetric operations, forceps, version, the Cæsarean section, and the like, occupy a large space with the consideration of the minutiæ of this subject. Indeed, it is hardly too much to say that some writers have given more attention to extra-uterine pregnancy than to pregnancy that is normal.

It is my observation that many practitioners and students regard extra-uterine pregnancy as an obscure subject to be reserved for specialists in gynæcology, and to be seriously studied only as a preparation for examination. Perhaps this is because of the disproportionate space so often allotted to the histopathology of the subject and to its endless bibliography. Whatever the cause it is a grave error and at some unexpected moment may result in disaster. Extra-uterine pregnancy is more common than twin-pregnancy and occurs alike in hamlet and hospital. Its main clinical phenomena and the guiding principles of its treatment are easily learned and should be constantly borne in mind.

The subject is considered at length in every text-book on gynæcology, and I will content myself here with a brief review of the essentials.

In the higher mammals, and presumably in man, the ovum and spermatozoön meet in the Fallopian tube, and the fecundated ovum, urged on by the ciliary current and probably also by the contractions of the muscular coat of the tube, finds its way into the uterine cavity, there to undergo further development. When for any reason it does not reach the uterus but remains and develops outside its cavity, the result constitutes what is known as extra-uterine pregnancy. Ectopic gestation and tubal pregnancy are terms often, but incorrectly, used as synonymous.

Frequency.—Extra-uterine pregnancy was formerly supposed to be of rare occurrence, but with better methods of diagnosis it is now known to be quite common. Pelvic hæmatocele, once described as an independent disease, is now known to be almost always the result of extra-uterine pregnancy. Many cases of tubal abortion pass unrecognized or are mistaken for ordinary abortions. Perhaps it is not too much to say that 1 per cent. of all pregnancies are extra-uterine.

Classification.—In the vast majority of cases extra-uterine pregnancy begins in the tube. Tubal pregnancy may be tubo-uterine, isthmic, ampullar, or tubo-ovarian. These terms are largely self-explanatory. In

tubo-uterine pregnancy the ovum is lodged in that part of the tube which passes through the uterine wall. The tubo-uterine variety is rare. Next in frequency is isthmic pregnancy. Ampullar pregnancy is the most common of all. Few cases of ovarian pregnancy have been observed. Primary abdominal pregnancy is no longer recognized. Difficulties in classification will disappear if we remember that, with the exception of ovarian pregnancy, all forms of extra-uterine pregnancy are either modifications or extensions of tubal pregnancy, both abdominal and broad ligament pregnancy being always secondary. Tubo-ovarian pregnancy usually begins in the tube and extends to the ovary. Very rarely the reverse is the case.

Etiology.—Strangely enough, but little is known as to the causes of extra-uterine pregnancy. Among those suggested are malformations, developmental anomalies of the tubes, pressure from tumors, peritoneal adhesions, etc.

Somewhat more plausible is the idea that inflammatory changes, usually gonorrhœal, constitute the chief factor. It has been suggested that the existence of a decidual reaction in the tube is found as an atavistic tendency in certain individuals, and that these are predisposed to tubal pregnancy. This theory, as well as that which refers the condition to shock, mental, emotions, etc., is purely speculative.

It is known that an ovum from one ovary may have crossed the pelvic cavity and entered the opposite tube, and it has been conjectured that during its transit it may grow too large to pass the contracted portion of the tube.

It is easy to see that many writers in seeking the causes of tubal pregnancy have reasoned from analogy rather than from actual experience. It is fair, however, to assume that tubal or uterine disease is in a general way a predisposing cause, since cases are apt to occur after a comparatively long period of sterility. This is about all that can be said at present.

Terminations.—The usual termination of tubal pregnancy is tubal abortion. It occurs in about seventy-five per cent. of all cases. Next in frequency is tubal rupture, and, rarest of all, the persistence of pregnancy until term. Tubal rupture is usually followed by the death of the fœtus, but in exceptional cases pregnancy continues. If the fœtus dies and is not removed by operative procedure, it may, if small, be completely absorbed. If not, it may undergo mummification or calcification. If bacteria gain access to the sac it may suppurate with the formation of adhesions to surrounding structures and the discharge of the fœtus, piecemeal, into the intestine, vagina, or bladder.

Tubal Abortion.—By tubal abortion is meant the rupture of the ovum, without rupture of the tubal wall. The hemorrhage is within the tube. The ovum may be completely, or only partially, detached (complete or incomplete tubal abortion). Partial detachment is more likely to occur when the ovum is located at the isthmus on account of the contraction of this part of the tube. In these cases the process is protracted, or ceases altogether, hemorrhage continuing, with the formation of a tubal mole.

In the ampulla there is more likely to be complete detachment of the ovum, with extrusion of the latter into the peritoneal cavity. The hemorrhage is usually confined to the lumen and immediate vicinity of the tube. In cases of profuse hemorrhage, however, the entire pelvic cavity may be filled. Coincidently with tubal abortion there occur some of the symptoms of ordinary uterine abortion, *e.g.*, painful uterine contractions, dilatation of the cervix, and the discharge of a structure resembling the decidua of normal pregnancy.

Tubal Rupture.—The penetration of the thin wall of the tube by the fetal elements results in the establishment of a weak spot which readily yields to mechanical violence, stretching of the tubal wall by the growing ovum, overdistention from hemorrhage, straining efforts, etc. Rupture

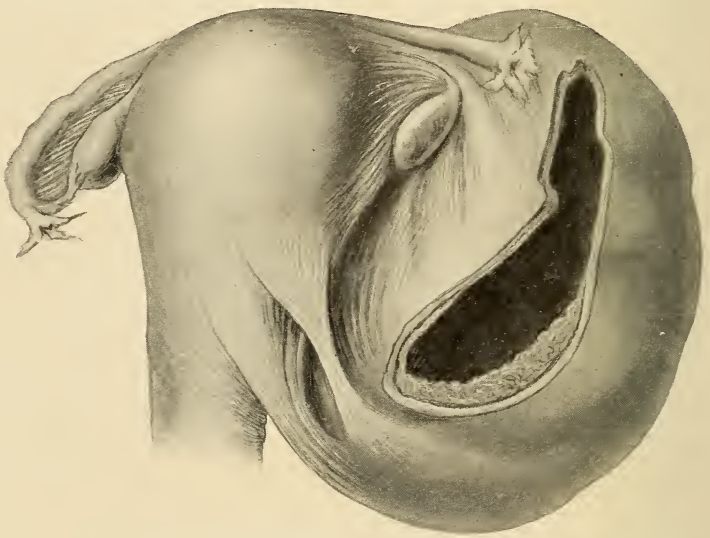

Fig. 184.—Broad ligament pregnancy. (Zweifel.)

usually occurs, if at all, before the third month, and according to its location the effused blood will escape into the peritoneal cavity or into the space between the broad ligaments. This is true also of the ovum, the result being either an abdominal or a broad ligament pregnancy (Fig. 184). If the ovum is expelled intact, or if the fœtus is completely separated from its placenta, the fœtus dies, but if the placenta remains attached, the fœtus may survive. In such cases the placenta becomes much enlarged, and is attached to the adjacent peritoneal surface over a wide area.

With complete maturity of the fœtus the placental circulation ceases, spurious labor ensues, and if artificial aid is not afforded, the fœtus dies and undergoes the changes already noted.

Clinical History and Diagnosis.—The early symptoms and signs of extra-uterine pregnancy resemble very closely those of normal pregnancy,

already described. The uterus is enlarged and there are the usual changes in the cervix and vagina. The breasts increase in size and, most significant of all, menstruation is delayed. I say delayed, because in the majority of cases a little irregular bleeding is noticed before the time for the second or third period has elapsed. There may be occasional attacks of faintness or vertigo. All these symptoms are significant if present, but unfortunately they are often absent.

Additional symptoms of great importance, when recognized, are pain in the affected side and the presence of a tumor in the same location. These latter symptoms, however, are usually, or at least often, distinguished by their absence. Pain may be slight or absent and it is often difficult or impossible to map out the tumor before the third month. Here skill in the bimanual examination counts for much and in a difficult case the practitioner will do well to avail himself of expert advice. There are some men whose sensitive touch enables them to recognize the soft fluctuation of the distended tube when it is quite imperceptible to others.

But a word of caution is necessary here. All manipulations should be gentle, since the sac has been ruptured many times in the course of a bimanual examination. An accident of this kind may result in severe hemorrhage. Bumm reports two cases of this kind. It is also evident that such an examination should never be made under an anæsthetic. If the patient is conscious she may be relied upon to give warning against too strong compression of the sensitive mass.

On the whole then, it is not strange that competent and careful observers are sometimes in doubt. The bimanual examination does not always give positive results, and there may be no definite subjective symptoms. Very often the condition is accidentally discovered in the course of a laparotomy performed for some other indication. In careless or incompetent hands it is usually diagnosed as normal pregnancy, and if a hemorrhage occurs it is regarded as a threatened abortion. In view of these facts, it is evident that every case of pregnancy which runs a course in the least atypical should be carefully studied, and that the appendages should be carefully palpated in every supposed case of uterine abortion.

Then, too, the history of the case is of considerable value. Very significant, as we have already seen, is a history of previous uterine disease, and especially of gonorrhœa. That extra-uterine pregnancy often follows a long period of sterility is an ancient observation.

To make a mistake in the diagnosis of this condition is a serious matter, and the practitioner will do well to examine all doubtful cases with care and to secure without delay such advice and assistance as he may deem necessary.

Many cases go on unrecognized until the occurrence of tubal abortion or tubal rupture serves to sharply remind the attendant and all concerned that something unusual is in progress.

What are the symptoms of tubal abortion? In most cases very much

the same as in ordinary uterine abortion. There is, of course, no ovum passed, but in its place a decidual cast or fragments of decidua. The pain is intermittent and is referred to the pelvic, lower abdominal, or ovarian regions. There is moderate hemorrhage. In the majority of cases the symptoms are slight and are overlooked or regarded as the evidences of an ordinary abortion. There may, however, be severe pain and marked tenderness over the affected tube, and, occasionally, the constitutional signs of severe hemorrhage. These cases can hardly be differentiated from those of tubal rupture.

After an abortion has taken place the tumor is so increased in size, owing to the effusion of blood, that it can be easily felt.

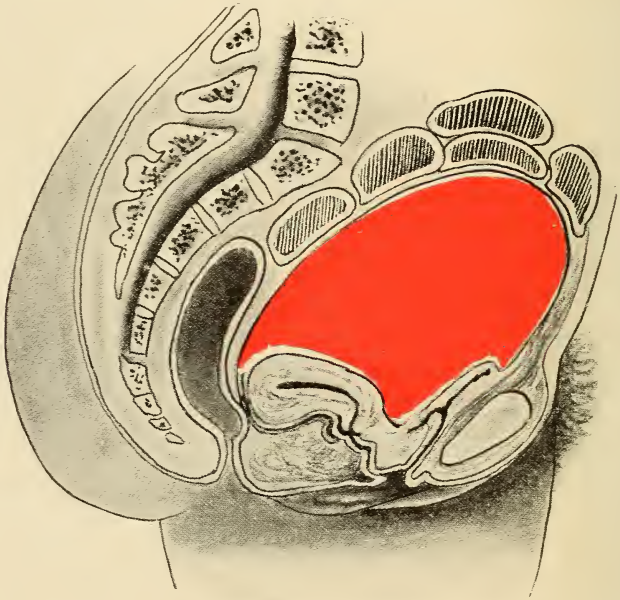

Fig. 185.—Anterior hæmatocele.

The discharge of decidual membrane is usually considered of much diagnostic importance, but its significance is of positive, rather than negative, value. Williams has shown that it is sometimes cast off and replaced by normal endometrium at an early period of extra-uterine gestation.

Rupture of the Tube

This is characterized by the suddenness of its onset and by the severity of the symptoms. Following sharp pain in the side, which, however, is not always present, symptoms of acute anæmia rapidly develop. The face is pale and drawn, the pulse rapid and feeble, the surface of the body is bathed in a cold perspiration, the patient calls for more air, in a word the

clinical picture is one of severe internal hemorrhage (Figs. 185 and 186).

External examination reveals, in addition to general tenderness, the presence of fluid, as shown by dulness in the flanks when the patient lies upon her back and tympanitic resonance in the middle where the intestines float upon the contained fluid. Then, too, the location of the area of dulness varies with the position of the patient, since the fluid naturally gravitates to the lowest level, and the gas-filled bowel to the highest (Fig. 187). The presence of free blood in the peritoneal cavity may be confirmed by the aspirating needle, or better, perhaps, by an incision in the posterior *cul de sac.*

Vaginal examination shows that the uterus is depressed as a whole, and

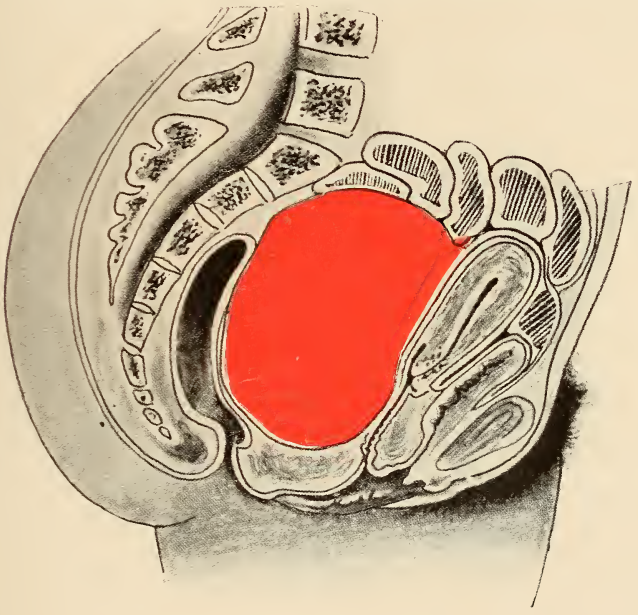

Fig. 186.—Posterior hæmatocele.

palpation of the posterior *cul de sac* may reveal some tension resistance to the examining finger, but no distinct tumor formation. In bad cases the condition of the patient becomes progressively worse and evidences of hæmatocele formation are wanting. On the other hand, if conditions are favorable, the pulse and general appearance gradually improve, and the increasing resistance, together with the gradual development of a tumor in the vaginal vault, betoken a favorable result. If the blood has been effused into the broad ligament, a tumor will be found at one side of the uterus displacing the latter to the opposite side, while if a pelvic hæmatocele is formed there will be general resistance in the posterior *cul de sac,* and the uterus will be fixed and immobile.

A sign justly emphasized by Polak, though seldom mentioned by others, is sensitiveness of the cervix to motion. Movement in any direction causes pain, due to dragging upon the overstretched and inflamed peritoneal surfaces.

Meanwhile the resources of the laboratory are not to be forgotten. Blood examination shows that both the amount of hæmoglobin and the number of red corpuscles are reduced. Moderate inflammatory reaction in the peritoneum results in an increased leucocyte count. These are of value in the less acute cases where a slow bleeding is going on for days (the reader should not forget the existence of these cases, even though

Fig. 187.—Hemorrhage into the peritoneal cavity.

they are rare), but in the acute cases, of the type just described, there is little time to wait for them.

Advanced Extra-Uterine Pregnancy

The diagnosis of advanced extra-uterine pregnancy should present no difficulty to the careful observer. The history of the case, together with the presence of a comparatively large tumor which can be separated from the uterus, usually suffices. As the months pass the fœtus, lying as it does directly beneath the abdominal wall, may be recognized, even by the tyro. The fetal heart sounds can be heard and the fetal parts felt, with startling

distinctness. Pain and shock, almost unendurable, may be caused by fetal movements. The uterus may be felt to contract separately from the tumor, and the peritoneal irritation caused by the presence of the relatively enormous foreign body results in alternating attacks of constipation, diarrhœa, and colic. Passing a sound into the uterus has been practised as a diagnostic measure, but should hardly be necessary except in cases of advanced tubal pregnancy, which is of necessity accompanied by persistent hypertrophy of the tubal musculature. In these cases strong contractions are felt in the tube, so strong, indeed, that they may be mistaken for uterine contractions. In the other varieties of extra-uterine pregnancy the sac does not contract, and the fact that the uterus may be made to contract separately by friction constitutes an important element in the diagnosis. Of course, the uterus is much smaller than it should be in advanced pregnancy.

Differential Diagnosis.—The condition with which tubal abortion is most commonly confounded is ordinary uterine abortion; but in the latter condition the pains are regular and increase progressively in frequency, while in tubal abortion they are irregular and spasmodic. Moreover, in tubal abortion, the blood is slight in amount, and although there may be a decidual cast or fragments of decidua, there are, of course, no chorionic villi. In tubal abortion the blood is slight in amount, dark in color, and does not contain clots, while in uterine abortion there is a profuse flow of bright red blood with abundant clots, and chorionic villi, as well as decidua, can be demonstrated, not to speak of portions of the fœtus. The demonstration of a mass at the side of the uterus makes the diagnosis almost certain, but unfortunately this is not always practicable.

Retroversion of the gravid uterus has been mistaken for extra-uterine pregnancy, but is distinguished from it by the prominence of bladder troubles and retention of urine. No competent observer should make this mistake. In both cases, of course, there are the subjective and some of the objective signs of early pregnancy. In retroflexion, however, the bladder symptoms, frequent and painful urination, retention, dribbling, are prominent. The fundus is absent from its usual position.

As elsewhere noted, pregnancy in the rudimentary horn of a bicornate uterus cannot be distinguished from extra-uterine pregnancy, but as the treatment in both cases is the same this is a matter of academic interest only.

Various conditions which may cause swelling or pain in the parametrium or iliac fossa, including ovarian cyst, pyosalpinx, and many others which it is hardly necessary to cite here, even including appendicitis, have led to confusion. They are not accompanied by the subjective or objective signs of pregnancy, however; the cervix is not patulous, and the uterus does not contain decidua. Moreover, the sudden and tragic collapse which attends tubal rupture and bad cases of tubal abortion is absent.

Every case of abortion should be considered as possibly one of tubal abortion, and the reader should not forget the possible, though extremely

rare, coexistence of extra-uterine pregnancy with normal pregnancy, and the possibility that normal pregnancy may be complicated by an adnexal tumor, *e.g.*, ovarian cyst.

Nor is it to be forgotten that a moderate leucocytosis accompanies extra-uterine pregnancy, a fact of importance when some inflammatory condition is suspected.

In all cases of doubt it is best to keep the patient under careful observation, preferably in a hospital. An excess of caution can do no great harm, while indifference or neglect may be attended by the most serious consequences.

Treatment.—This is best considered under three heads:

1. Treatment in the early months before abortion or rupture.
2. Treatment of tubal abortion and tubal rupture.
3. Treatment of advanced pregnancy.

1. In the early months, before either abortion or rupture has occurred, the treatment consists in laparotomy and the removal of the ovum together with the affected tube. The chances of the ultimate survival of the child are so small, and the danger to the mother involved in the continuance of pregnancy so great, that temporizing is the height of folly. Certain writers have recently advised attempting to save the tube by incising it, removing the ovum, and sewing up the incision. The value of this procedure is still *sub judice*.

2. In the case of abortion or rupture the treatment will depend upon the condition of the patient. In most cases of abortion there are no special symptoms and no treatment is required. Indeed, tubal abortion often passes unnoticed by the patient, who regards it as an ordinary menstrual period. Occasionally the symptoms are very severe, and the treatment is the same as for uterine rupture, from which in such cases it can hardly be distinguished.

Treatment After Rupture.—This has recently become a matter of dispute. It was formerly the custom to operate immediately in all cases, and at first thought this seems the only logical method. I am convinced, however, that immediate operation, especially in hands not over skilful, has sometimes turned the scale in the wrong direction. The question is complicated by the fact that it is not always possible to differentiate tubal abortion from tubal rupture, or to determine how much of the apparent gravity of the case is due to shock, and how much to hemorrhage. Statistics are fallacious. If an operation is performed and the patient dies, it is said that the operation was performed too late. If no operation is performed and the patient dies it may be said that an operation would have saved her life. Much depends upon the ability of the attendant, both as diagnostician and operator. Robb believes that it is better to defer the operation, claiming that death as an immediate result of the hemorrhage is rare, and that the patient should be allowed to recover from the shock. Polak, after an extensive experience, is of the same opinion.

Perhaps the situation may be thus summed up. If the patient is not plainly *in extremis,* if the operator is competent, and if the diagnosis is positive, immediate operation is the safest course. If the operator is in doubt or the patient appears to be holding her own, it is better to wait, meanwhile keeping a careful watch upon the pulse and general condition. The patient is kept quiet, the foot of the bed is raised, and morphine administered hypodermatically. A Murphy drip is installed. The latter has the advantage of slowly restoring the volume of the circulation without starting the bleeding afresh. Active stimulation is to be avoided, since this may also cause renewed bleeding. If the threatening symptoms subside, as they often do, a waiting policy is to be pursued. If not, operation should on no account be delayed.

Technic.—Little time need be lost in preparation. The operative field is painted with tincture of iodine without previous washing. A median incision is made and the hand carried directly to the uterus, which is at once delivered through the abdominal incision. Two clamps are applied to the adnexa of the affected side; the first near the uterus, and the second near the pelvic wall. As soon as the abdomen has been opened there may be profuse hemorrhage, but the operator should not allow this to disconcert him. Recalling that this blood has already been lost to the circulation and that its further escape can do the patient no harm, he should proceed carefully but rapidly. After the clamps have been applied the hemorrhage ceases, and the operator has more leisure to tie the ovarian vessels and unite the cut surfaces of the broad ligaments. The abdominal wound is then closed by a few interrupted sutures of silkworm gut. No great time should be spent in attempting to clear the peritoneal cavity of all traces of blood, the presence of which does no harm, or at least not as much as would the prolongation of the operation. Two or three pints of hot salt solution may be left in the peritoneal cavity. This is rapidly absorbed and helps to restore the volume of the circulation. Furthermore, the presence of the hot solution helps to minimize shock. The abdominal wound is closed by a few interrupted sutures of silkworm gut. During the operation saline solution may be injected under the breasts. The anæsthetic should be ether oxygen. Morphine should be used hypodermatically to lessen the amount of ether required. Only a few drops of the latter may be necessary and its administration should be discontinued as soon as possible (Fig. 188).

If the general condition improves and evidences of hæmatocele, as shown by tumor formation in the *cul de sac of* Douglas, develop, an ice-bag serves to relieve pain, and perhaps to diminish the risk of further bleeding. Meanwhile the patient is kept quiet in bed and supportive treatment instituted. Active catharsis is avoided, but the bowels are kept open by water or oil enemata. Later, absorption may be hastened by hot vaginal douches, and perhaps by massage.

The attendant must not fancy that all danger is over. The bleeding may begin anew or the hæmatoma may become the seat of infection. In

the former case the abdomen should be opened and the offending structures removed. Here the vaginal route is not suitable, work done in this way being necessarily imperfect. If, however, the hæmatoma becomes the seat of infection, it is better to make a free incision in the *cul de sac* and pack this lightly with sterile or mildly iodized gauze, thus avoiding the transmission of infection to the peritoneal cavity.

Since the adoption of modern methods of treatment, the management of advanced extra-uterine pregnancy has become a problem with which even the specialist seldom has to deal. Nowadays one seldom sees advanced

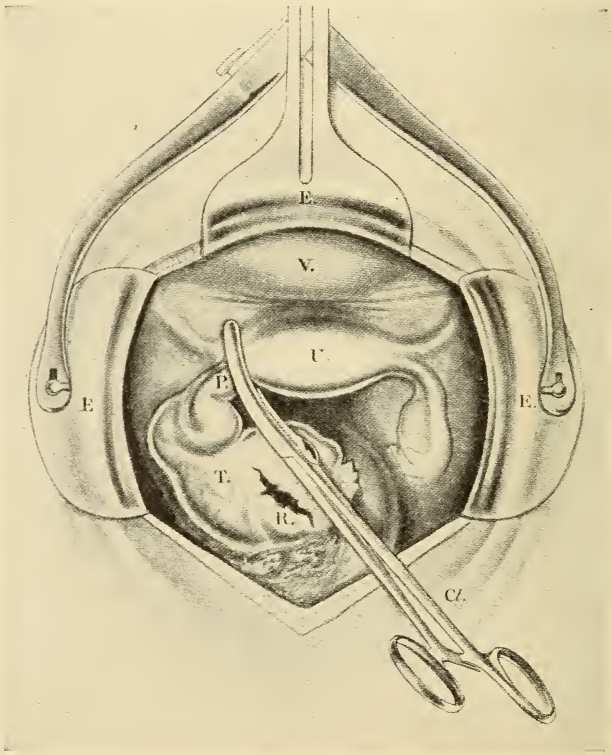

Fig. 188.—Tubal pregnancy. Clamp applied to broad ligament at the uterus.

cases even in hospital or consulting practice. The distinguishing features of these cases are, first, that the child is alive; second, that the fetal sac is adherent to many surrounding structures, and last and most important of all, that the placenta is attached to structures that do not contract as does the uterus in normal labor, and that hence the normal safeguards against hemorrhage are absent.

These facts not only render the operation a difficult one, but make it

more difficult as times goes on, and from the stand-point of the mother, the earlier it is performed the better. Before the period of viability of the child there can be no doubt as to the propriety of operative interference, and even after this period has been reached the parents should be informed of the perils of further delay.

The disposition of the placenta presents a difficult problem. It may be attached extensively to the intestines and an attempt at removal involves not only the danger of very serious hemorrhage but also of extensive laceration of the gut. It is, therefore, better in the majority of cases to tampon the operation wound with sterile gauze, leaving the placenta *in situ* to come away naturally.

There are cases in which the sac is pediculated or completely enclosed within the layers of the broad ligament and in these cases the operation is unexpectedly easy. No one can foretell this, however, and it is obvious that, whenever possible, the patient should be removed to a hospital for operation.

CHAPTER XVII

ANOMALIES OF THE FŒTUS AND ITS APPENDAGES

The study of fetal anomalies and monstrosities belongs to the domain of teratology, and from the stand-point of pure science is very interesting, but in a practical work on obstetrics it should not detain us long. We will consider here only those forms which are of clinical importance or special interest.

Hydrocephalus

Among these the most common is hydrocephalus (*Hydrocephalie,*

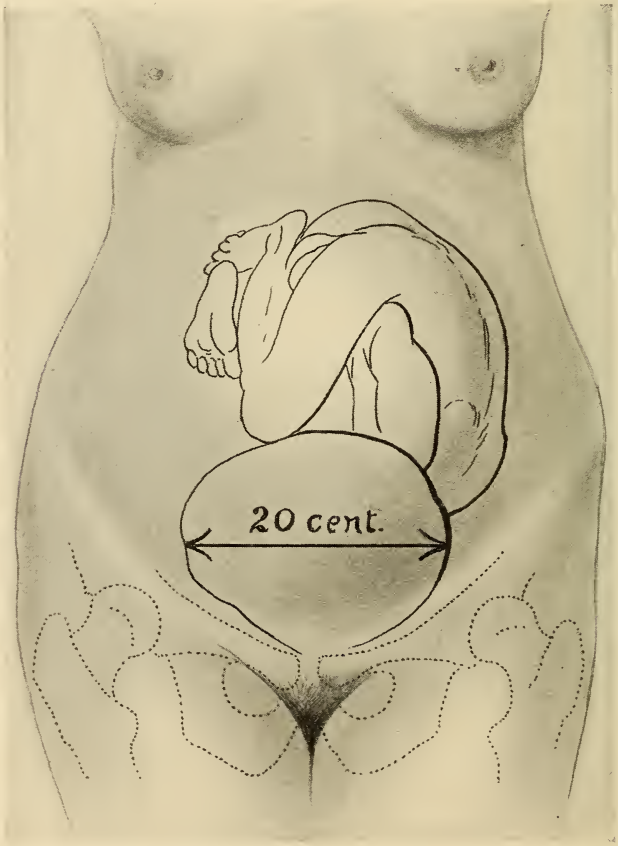

Fig. 189.—Signs of hydrocephalus during pregnancy. Fundus high.

Wasserkopf). Every man who does much obstetrical work meets an occasional case of this anomaly. The name tells most of what we know about the essential condition. There is an over-accumulation of the cerebro-

spinal fluid in the ventricles of the brain. As a result the head becomes enlarged, sometimes enormously, perhaps two or three times its normal size. The bones of the skull are thinned to a notable degree, the sutures are much wider and the fontanelles much larger.

Etiology.—Little or nothing is known as to the cause. The condition, however, is often associated with other abnormalities, *e.g.,* spina bifida or club foot.

Influence Upon Labor.—As might be expected, the course of labor is

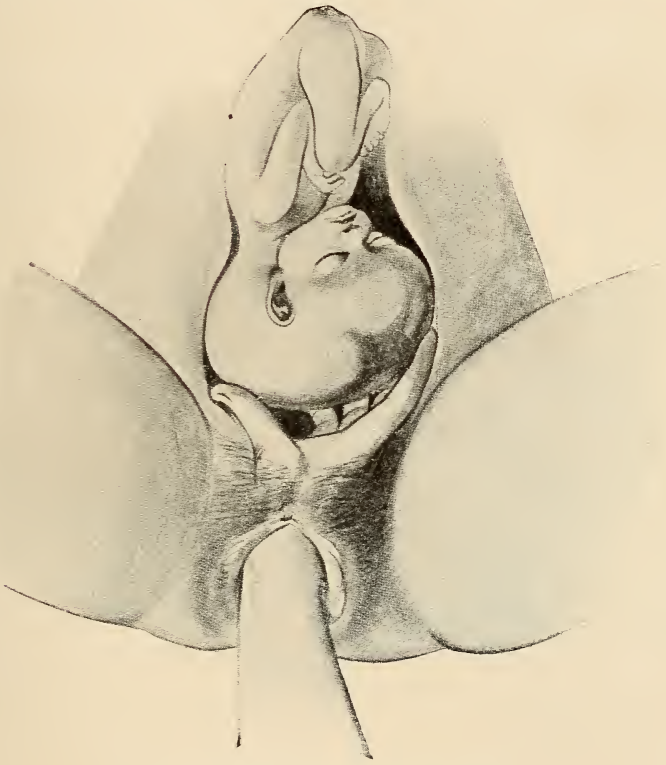

Fig. 190.—Palpating the hydrocephalic head.

profoundly influenced. The first stage is tedious, the cervix dilates slowly, and after a time, perhaps, dilatation ceases altogether. It is possible for a hydrocephalic head of considerable size to become so moulded as to enter or even pass the pelvic brim, and now and then the cranial vault, its thickness reduced almost to the vanishing point, bursts, and the fluid is expelled, the head collapsing as after craniotomy. Such occurrences are rare, however, and cannot be depended upon. In the great majority of cases the condition constitutes an insuperable bar to normal delivery. The head cannot enter, much less pass, the brim, and if the condition is not relieved,

either by nature or art, exhaustion, sepsis, or rupture of the uterus supervenes. The latter accident is especially frequent. According to Fabre these ruptures, which are almost always fatal, usually originate at that point where the forehead impinges most prominently against the uterine wall, and where the tension is naturally greatest.

Diagnosis.—This is an important matter, since a mistake may result in serious consequences. Valuable information may be obtained by external examination. The head will be found much enlarged and well above the brim, even though the patient be a primipara. The body is relatively small. The dorso-occipital angle, as I have ventured to term it, is marked and unmistakable, reminding one of face presentation. The shoulder is felt, and the fetal heart heard, if at all, at a higher level than usual — in the neighborhood of the umbilicus. As might be expected breech presentation is not uncommon. Protrusion of the abdomen is somewhat more marked than in uncomplicated cases. On palpating the head a crackling sensation, like that which one feels in palpating the head of a dead fœtus, is often appreciated.

Fig. 191.—Hydrocephalic after-coming head. Extracted by means of crotchet in the mouth.

The condition is often overlooked by those who do not practise external examination as a routine measure, but can hardly escape observation by one who uses modern methods.

Whatever doubt remains is dissipated by the internal examination. The sutures and fontanelles are widened and enlarged, sometimes enormously. The great size of the soft fluctuating cranium and the relatively small size of the face can hardly escape attention. Since, however, the head is high and difficult to reach it may be necessary to introduce the hand into the uterus before one can make a satisfactory examination and a positive diagnosis (Figs. 190 and 191).

If there is unexpected delay in the delivery of the after-coming head, one should always think of the possibility of hydrocephalus, especially in the case of a premature child, since in these cases the delivery of the small after-coming head is, under normal conditions, always easy. If the child has spina bifida, or club foot, the possibility becomes practically a certainty.

Prognosis.—This is good if the condition is recognized in time and properly treated. If not, it is indeed gloomy, for, except in the rare cases

in which the head molds or bursts, the case will terminate in one of the ways already mentioned. Many cases of rupture of the uterus have been reported.

Treatment.—If the disproportion is very great we are usually driven to the cruel alternative of perforation. It is better to endeavor first to aspirate the fluid with an aspirating needle or a fine trocar and to avoid as far as possible the neighborhood of the cerebral sinuses. Many of these children have lived to grow up, and the physician has no right to constitute himself executioner because the child may be an imbecile. With the evacuation of the fluid the skull collapses and the efforts of nature may be sufficient to accomplish delivery.

Perforation of the after-coming head may prove difficult. In this case one may exsect a piece of one of the cervical vertebræ and pass a catheter through the spinal canal.

Fig. 192.—Acrania and anencephalus.

Acephalus or Anencephalus

This is the converse of hydrocephalus and much more rare. In this variety the entire cranium is lacking. The condition is illustrated in Fig. 192. It is likely to make trouble in the diagnosis of position and presentation. I recall the case of a patient near term, in which I was unable, after careful palpation, to feel the head through the abdominal wall, although there seemed no reason why palpation should be difficult in this particular case. Some time later the patient was delivered of an acephalic fœtus. I had not been able to feel the fetal head because there was no fetal head to be felt. In the acephalic fœtus all that remains of what under other circumstances would be the cephalic pole is the face. Vaginal examination reveals nothing characteristic. The condition has been mistaken for breech presentation.

Treatment.—The first stage is likely to be prolonged since the acephalic head is a poor dilator of the cervix. If delay should occur the best treatment would be version, since there could be none of the usual trouble with the after-coming head.

Double Monsters

No one has seen enough of these cases to be able to formulate rules derived from experience, and any attempt to reproduce here all the malpositions and malpresentations which might occur with the treatment of each would be a species of pedantry bordering closely on the ridiculous (Fig. 193).

Unusual Abdominal Enlargement

This condition may prevent or complicate delivery. Among the causes that have been noted are cysts of the kidneys, retention of urine, and ascites. When the enlargement is due to an increased fluid content simple "tapping" of the fœtus is sufficient. If this does not suffice thoracotomy or evisceration may be necessary.

Fig. 193.—Helen and Judith, ischiopagæ.

General Dropsy of the Fœtus

This is rare, but is of considerable importance clinically, since it may be the source of delay in labor. The condition is one of general œdema of the fœtus and placenta. The fœtus is still-born, or at best lives but a few hours. We have no definite information as to the cause of the condition.

Rigor Mortis

This phenomenon occurs within as well as without the uterus. Its existence at birth is, of course, evidence that death occurred some time before delivery and thus excludes most cases of late asphyxia and of injury during operative delivery. As might be expected, rigor mortis renders delivery, whether normal or operative, more difficult by interfering with those movements of flexion and adaptation so essential to its normal progress and completion.

Abnormalities of the Placenta

By far the most important of these from a clinical stand-point is placenta prævia. Next in order comes hemorrhage from the normally implanted placenta. Both are discussed in connection with the puerperal hemorrhages.

placenta succenturiata

Next in importance are the placentæ succenturiatæ (Fig. 194) or accessory placentæ (*Nebenkuchen* of the Germans), small masses of placental tissue developed upon the chorion at some distance from the

border of the true placenta. They are usually overlooked by those who do not make a careful examination of the placenta and membranes in every case. Their presence is announced by the discovery of vessels torn across at the placental border. In some cases (and this is usually forgotten) these connecting vessels are absent and the only clue is found in defects in the membranes—an additional reason for examining the latter. The reader will recall that these defects will be in the chorion, therefore

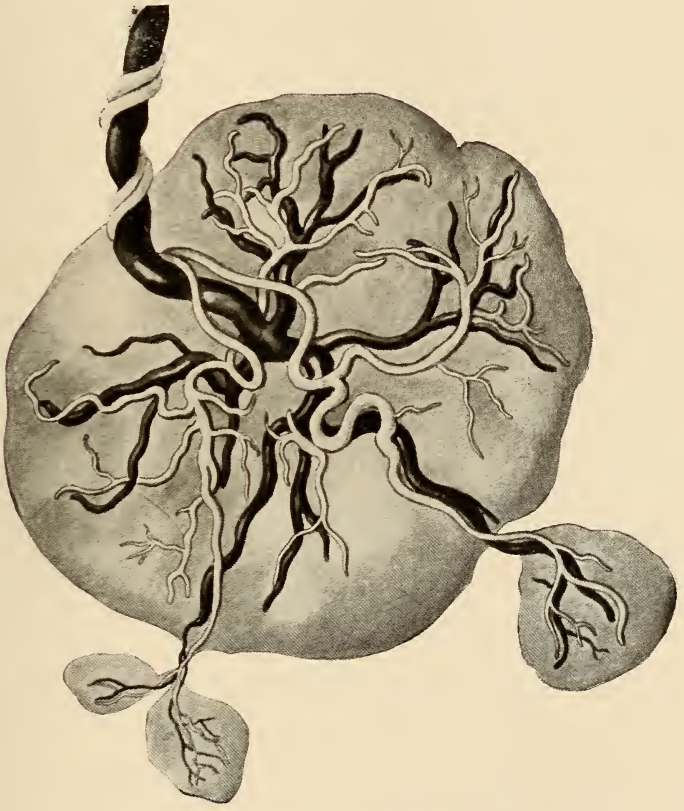

Fig. 194.—Placenta with three succenturiate placentæ.

not only the margin but the entire surface of the membranes should be examined in a good light. An irregularly round or oval aperture in the chorion, with raised edges and vascular connections, denotes that a succenturiate placenta remains in the uterus. It is true, of course, that the signs above mentioned are seldom observed and the practitioner may look a long time, perhaps a lifetime, without finding them. Nevertheless it is wise to look. An hour or more must, or at least should, be spent with the patient after delivery and but a few minutes need be occupied by these precautions. Moreover, these anomalies are occasionally found and the protection

afforded to the patient is not altogether theoretical. By care in this respect the attendant not only forestalls criticism but is better prepared to treat infection should it occur. Last, but not least, he is cultivating habits of care and scientific accuracy which will cling to him through his professional career and be of incalculable value to his patients and himself.

PLACENTA MEMBRANACEA

A rare placental anomaly is the attachment, or as it were the "spreading out," of the placenta over the entire chorion instead of over the serotina

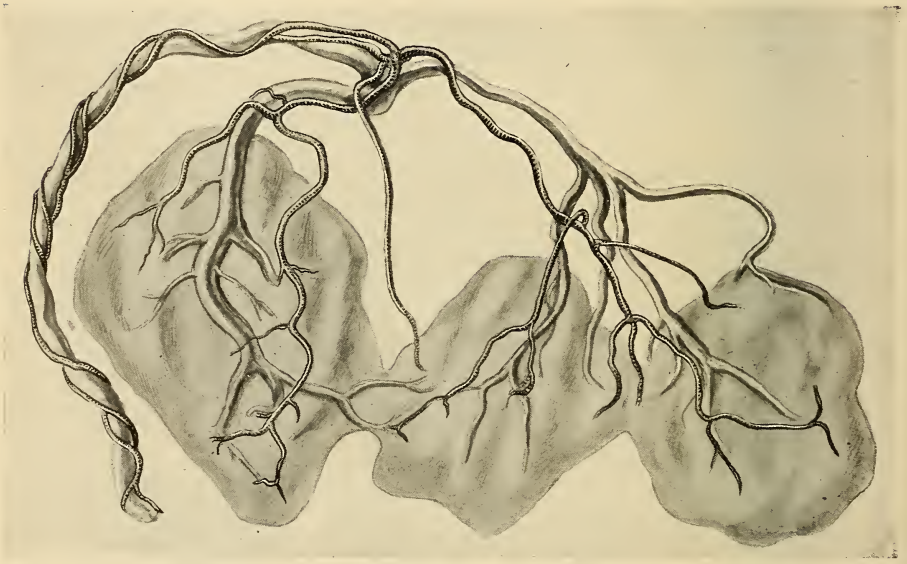

FIG. 195.—Placenta tripartita. (After Hyrtl.)

only. The clinical importance of this anomaly is that it may make manual removal of the placenta necessary.

PLACENTA CIRCUMVALLATA

In certain cases there is an elevated whitish circular border along the placental margin which has nothing to do with infarct formation, but is caused by the infolding of the membranes. The mechanism of its production is not well understood. The condition is known as placenta circumvallata, and is of some clinical significance, inasmuch as it may retard the separation of the placenta after delivery, and predisposes to the retention of the membranes, which may be torn all round the placental border and retained *in toto*.

PLACENTA DUPLEX, PLACENTA BIPARTITA, ETC.

Sometimes in place of a single placenta there are two placentæ, united only by a membranous septum, and with no vascular connection. Here

one speaks of a duplex placenta, or, if there are three similarly connected, of a triplex placenta; and so on. As many as seven have been noted. Again, the placenta may be divided into two parts, the vessels, how-

FIG. 196.—Placenta septuplex. (After Hyrtl.)

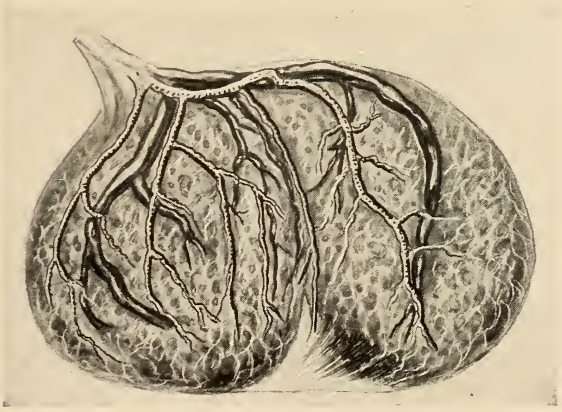

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FIG. 197.—Placenta bipartita. (After Williams.)

ever, extending from one part to another, as in Figs. 195 and 196. These conditions are rare, but it is wise to recall the possibility of their occurrence and to examine every placenta carefully (Figs. 197 and 198).

INFARCTS OF THE PLACENTA

Under this familiar heading we recognize a condition with which every obstetrician is clinically familiar—white or yellowish-white masses of varying size and shape scattered throughout the placenta. According to Williams, Eden and others, they are due to obliterating endarteritis of the chorionic villi. But what is the ultimate cause?

Von Franquè attributes them to endometritis, while Hitschman regards the process as the physiological preliminary to placental separation at term. DeLee suggests, and it seems to me with good reason, that they are simply the usual vascular changes of nephritis affecting the placental blood-vessels.

They are constantly found in nephritis and other conditions of high

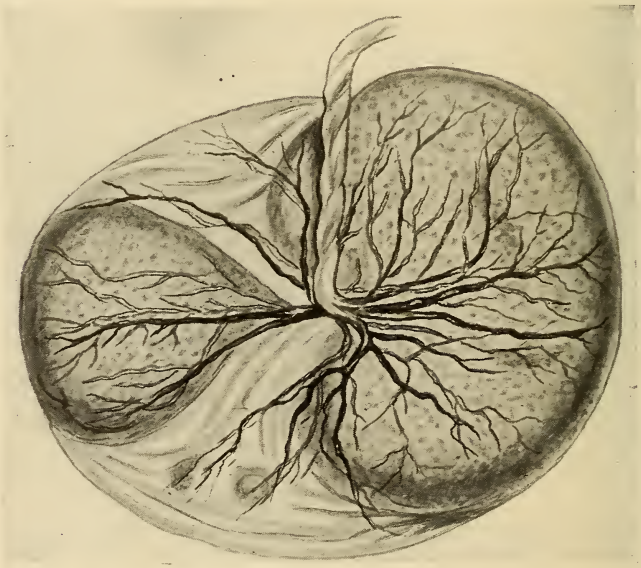

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FIG. 198.—Placenta duplex with two succenturiate lobules. (After Williams.)

tension. It is self-evident that when at all extensive they must interfere with the nutrition and oxygenation of the fœtus.

Now and then a white band composed of infarcts will be found extending around the placental margin—placenta marginata. This resembles the placenta circumvallata, previously mentioned, but has nothing in common with it except the resemblance.

Sometimes the infarcts are of a dark or bright red color and surrounded by a fibrous capsule (red infarcts). These are found in nephritics and albuminurics.

Tumors and foreign growths of the placenta are rare. The most common is the myxoma fibrosum placentæ of Virchow. Sarcoma has been

FIG. 199.—Normal central insertion of the umbilical cord.

FIG. 200.—Marginal insertion of the umbilical cord.

observed. Most tumors of the placenta are the result of the hypertrophy of the vessels and may be grouped under the general heading of chorio-angiomata. Cysts of the placenta result from the breaking down of infarcts or of the trophoblastic cells, which make up the bulk of the decidual septa (Williams).

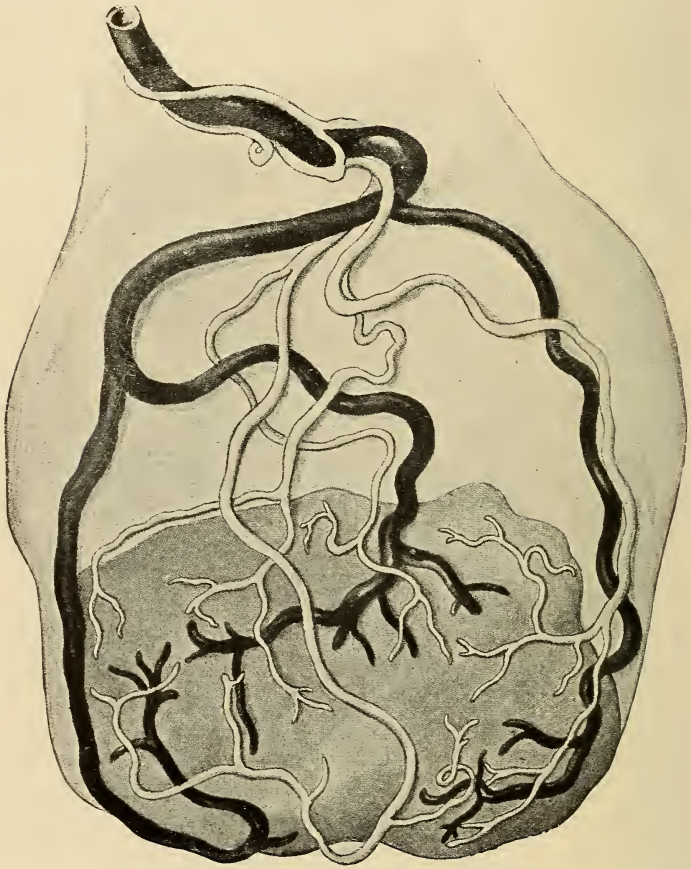


Fig. 201.—Velamentous insertion. (After Hyrtl.)

Anomalies of the Cord

The placenta insertion of the cord varies. It may be, in the order of frequency, eccentric, centric, marginal or velamentous. In the eccentric form the cord is inserted between the margin and the centre of the placenta. In the centric form at or very near the centre. In the marginal form at the margin. In the velamentous insertion the vessels separate before reaching the placental margin and run for some distance covered only by the membranes, as shown in Fig. 201. This insertion

is more common in twin-pregnancy. Williams found in 2000 cases that the relative frequency was as follows: Eccentric, 73.25 per cent.; centric, 18.25 per cent.; marginal, 7.25 per cent.; velamentous, 1.25 per cent.

Of these insertions only the last named is of clinical importance. If in a case of low implantation of the placenta the uncovered vessels of the cord come to lie in front of the head they may be compressed with resulting asphyxia of the fœtus.

The cord may vary very much in length. Cases have been recorded in which the cord was absent. In these cases its place was taken by an umbilical hernia. The longest cord on record was 198 centimetres.

Knots in the cord are of two kinds, false and true. The false knots are caused by varicosities of the umbilical veins, or arterial nodes, and while they look like knots are in reality not knots at all. The true knot, which is the result of the child's passing through a loop in the cord, is a very different thing, and now and then causes the death of the fœtus. Sometimes the cord is twisted. The number of twists may be enormous. Schauta reports 380 in one case. They occur mostly in premature and dead children and have no special clinical significance. They are said to occur more frequently in male children, which seems an absurd conclusion. Cysts of the cord are common but of no practical importance.

Fig. 202.—Cystic degeneration of villi of the chorion.

The length of the cord is a matter of considerable clinical importance. A short cord may cause delay in the second stage of labor. It may also cause complete or extensive detachment of the placenta with dangerous hemorrhage. Shortness of the cord may be absolute or relative. If a cord of average length is twisted two or three times around the child's neck it is to all intents and purposes a short cord.

Diseases of the Chorion

hydatidiform mole (cystic degeneration of the chorionic villi)

Of the various abnormalities of the chorion the one possessing most importance is cystic degeneration of the chorionic villi, otherwise known by the clumsy but ancient appellation of hydatidiform mole.

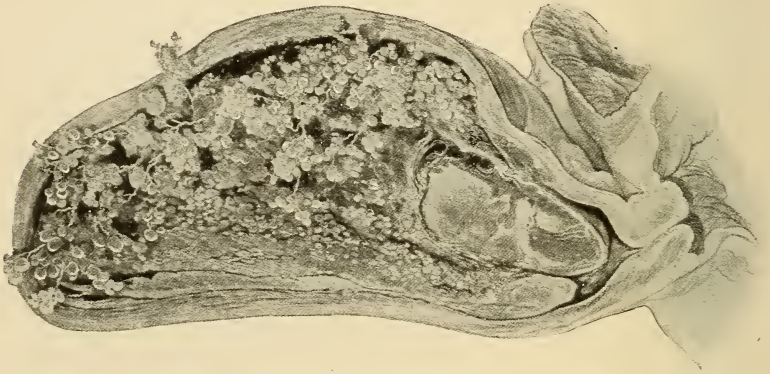


Fig. 203.—Uterus containing a vesicular mole. (Ahlfeld.)

Pathology.—The appearance is characteristic and not to be forgotten. Within the decidua, which covers it like a hood, is a great mass of cysts of various sizes. Some of them are as large as grapes, or even larger, and often so arranged as to remind one of clusters of grapes. These cysts are filled with a clear fluid containing mucin and albumin. Now and then

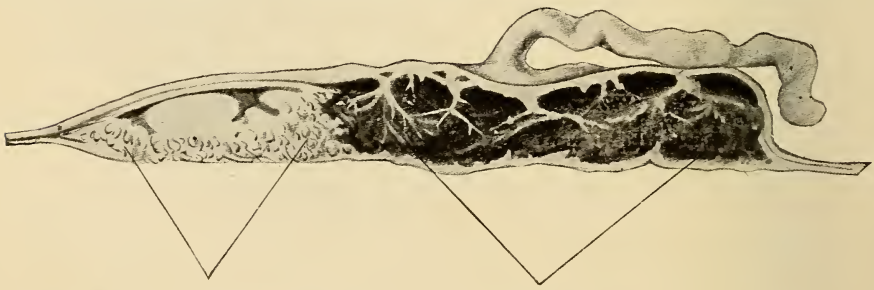


Fig. 204.—Partial myxoma of the placenta.

an amniotic sac with its contained embryo is found in the midst of the mass but more often there is no trace of one, although the maternal portion of the cord may be recognized (Figs. 203 and 204). If the degenerative process does not begin until after the formation of the placenta it may involve but a small part of that organ and pregnancy may continue. This is well shown in Fig. 204. Virchow taught that the condition is a myxoma

of the chorionic villi, but later investigations have shown that the process begins in the two epithelial layers, the syncytium and Langhans's layer, involvement of the mucous tissue being secondary.

Etiology.—Nothing definite is known as to the cause of this condition. Endometritis is probably a predisposing factor. It appears, however, that the condition may in some cases be of fetal origin, since in the case of twins one may escape while the other becomes converted into a mole. There is no lack of ingenious hypotheses, but certainty is lacking. The condition may occur in extra-uterine pregnancy and it may coexist with polycystic degeneration of the ovaries. It is in many cases the precursor of deciduoma malignum (Fig. 205). It is plain that if we knew all about the pathology and etiology of this condition we would be able to clear up some of the mysteries that still cloud the physiology and pathology of pregnancy.

Frequency.—The condition is not common and few practitioners, even among those who practise obstetrics as a specialty, have seen many examples. It is said to occur about once in 2500 cases.

It is more common in multiparæ and in women approaching middle life, a point which speaks in favor of endometritis as a cause.

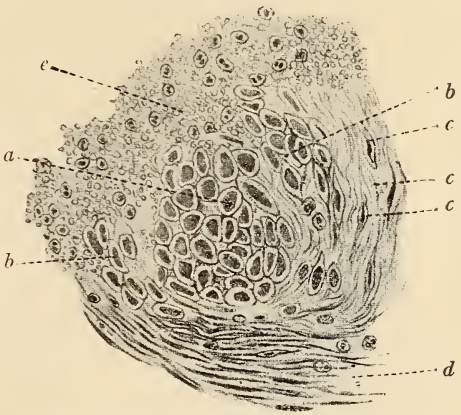


Fig. 205.—Deciduoma malignum. (Sänger.) *a*, nest of decidual cells; *b*, another developing; *c*, intermuscular connective tissue; *d*, muscle-fibres; *e*, extravasated blood.

Clinical History and Diagnosis.—Fortunately the diagnosis of this condition does not present difficulties comparable to those which attend its etiology and pathology.

Inspection shows that the uterus is too large and the fundus too high for the period of pregnancy which has been reached, and that the body of the uterus is softer than it should be. Ballottement cannot be practised and no fetal parts can be outlined. There are, of course, no fetal movements and no fetal heart-sounds. The disease is essentially one of early pregnancy. When it occurs later, only part of the chorion is affected and the fœtus may survive. This, however, is rare. Sooner or later hemorrhages begin. The blood is thinner and lighter in color than in placenta prævia but the quantity may be sufficient to cause profound anæmia or even death. The bleeding is painless and occurs without reference to uterine contractions. Diagnosis should present little difficulty to one familiar with the antepartum examination of pregnancy. Most significant of all is the size of the uterus, which is out of all proportion to the period of pregnancy. Of course the expulsion of a cyst—even one—

settles the matter, but so would the presence of a cystic growth in the vagina, since this would be a metastasis from the uterine cavity.

Fabre has observed the frequent coexistence of albuminuria and the vomiting of pregnancy. DeLee has made a similar observation.

Treatment.—It is best to empty the uterus as soon as the diagnosis is made. We do not know how numerous or how severe future hemorrhages may be, and there is always the possibility of the development of the dreaded sequel, deciduoma malignum.

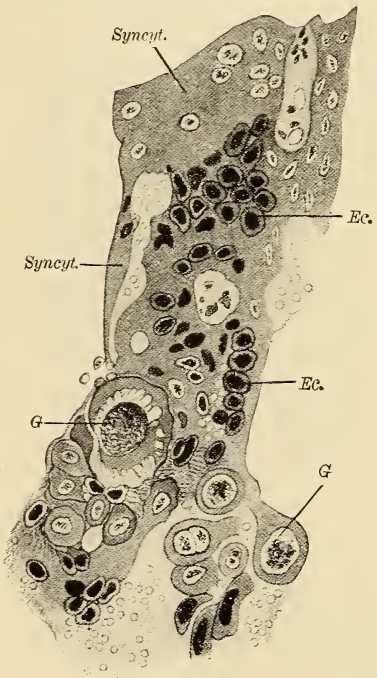


FIG. 206.—Chorio-epithelioma malignum. (Ulesco-Stroganowa.) *Syncyt.*, tissue consisting of syncytium; *Ec.*, ectoderma cells, or chorion epithelium; *G*, giant cells.

Brusque and heroic measures are out of place, however, since the uterine wall may have been weakened. If the cervix is sufficiently dilated, *e.g.*, if an abortion is in progress, the uterus should be emptied of its contents by the method described in connection with the management of incomplete abortion. If not, the vagina should be carefully tamponed. This experiment not only serves to check hemorrhage but also to produce softening and dilatation of the cervix. Meanwhile ergot may be given hypodermatically, since the usual contraindications to its use are absent. The curette should be avoided, as there is considerable danger of perforation in these cases. The attendant should remain with his patient until all immediate danger seems to have passed. The hemorrhage may be exceedingly free, especially if the patient has passed the fourth or fifth month. If bleeding continues after the uterus is empty the latter should be promptly and thoroughly packed. If an anæsthetic is necessary ether or nitrous oxide is to be preferred.

The patient should be kept under observation for several years with reference to the possible development of chorio-epithelioma.

CHORIO-EPITHELIOMA

In this condition, first recognized by Sanger in 1889, there is a malignant degeneration of the syncitium and of the cells of Langhans's layer, the structures involved in molar pregnancy. Sanger regarded it as a sarcoma, but its true nature was first discovered by Marchand in 1895. It was he who gave it the name chorio-epithelioma. It takes its origin

from the placental site and is characterized by a startling rapidity of growth and by its tendency to metastatic involvement of distant regions, especially the brain and lungs through the medium of the blood-vessels (Figs. 206 and 207).

Now and then metastases are observed about the vagina and vulva and after a time these metastases contain blood and villous cysts. They are

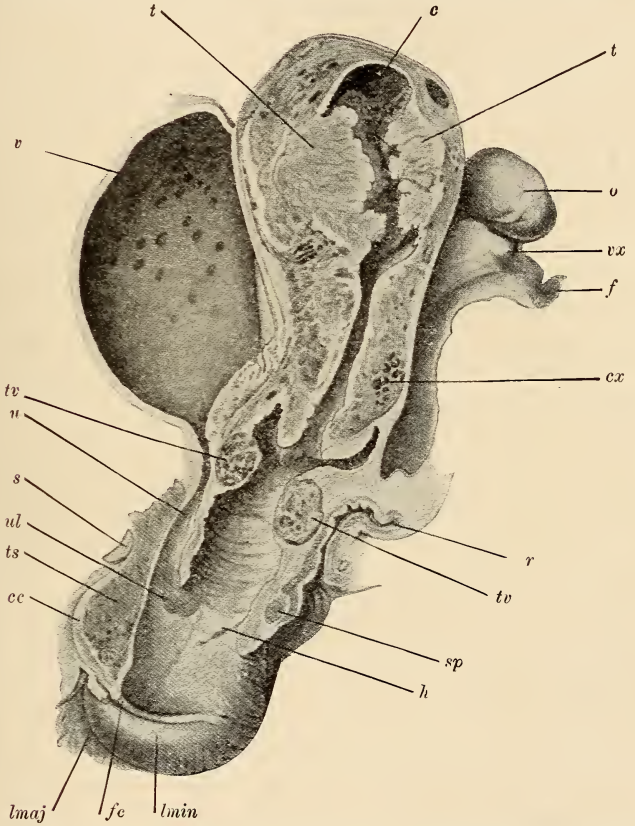


FIG. 207.—Sagittal section through the pelvic organs of a patient with chorio-epithelioma malignum. (Marchand.) *c*, cavity of the uterus; *tl*, malignant tumors in the body of the uterus; *v*, bladder; *o*, enlarged œdematous right ovary; *cx*, varicose tumor beside the ovary; *f*, fimbriæ; *cx*, cervix, infiltrated with blood; *r*, rectum; *tv*, *tv*, tumors in the vagina; *u*, urethra; *s*, symphysis pubis; *sp*, sphincter ani muscle; *ul*, ulceration of the meatus urinarius; *ts*, sanguineous tumor between the urethra and the pubic arch; *cc*, corpora cavernosa clitoridis; *h*, hymen; *fc*, frænum clitoridis; *lmaj*, labium majus; *lmin*, labium minus.

probably simply transplanted villi, since excision has resulted in their complete disappearance without recurrence.

Etiology.—We know little or nothing of the cause of epithelioma, whether in the placenta or elsewhere, but we do know the invasive properties of the fetal ectoderm and its tendency to invade the blood-vessels. It is not strange that epithelioma of this structure should make rapid progress.

The great predisposing cause is pregnancy. About 50 per cent. of the cases follow molar pregnancy, but the latter is not a necessary forerunner. Chorio-epithelioma may follow abortion or labor at term.

Clinical History.—Atypical hemorrhage is the first symptom. In perhaps half the cases it follows molar pregnancy, in others labor at term. In still others it follows abortion. If curettage is done after an early abortion, and done properly, hemorrhage promptly ceases. The same thing is true if the uterus has been emptied, *lege artis,* for mole pregnancy. Therefore, if irregular bleeding persists in either of these cases or after delivery at term, a microscopical examination by a skilled and careful pathologist should be made.

The time at which the symptoms appear is very variable. They may be noticed within a few days or not until a few years after delivery. The growth has even been made out in the case of mole pregnancy before the expulsion of the mole.

The symptoms are those of anæmia from the hemorrhages, and cachexia and sepsis from the malignant growth in the uterus; pallor, debility, progressive emaciation and a foul vaginal discharge. As in pyæmic infection the metastases will produce symptoms that vary with the location. For example, in pulmonary metastasis there may be dyspnœa, bloody expectoration, cough, physical signs, sharply localized, etc.

These symptoms, while typical, are by no means constant. According to Williams the appearance of vulvar or vaginal metastases is in more than one-half the cases the first evidence of the existence of the growth *in utero.* Strangely enough, these vulvar and vaginal lesions may be present when the uterus contains nothing abnormal.

Treatment.—The treatment for chorio-epithelioma is hysterectomy, and in view of the rapid progress of the affection the operation should be performed as soon as the diagnosis is established. Cysts of the vagina and vulva should be excised.

Diseases of the Amnion (Hydramnion. Oligo Hydramnion. Amniotic Bands. Amnio-Uterine Adhesions)

hydramnion

By this term is meant an excessive amount of amniotic fluid. But the question is asked at once, "What is an excessive quantity?" Perhaps two litres would be approximately correct, but even this amount, while it may be a source of discomfort to one patient, would be quite unnoticed by another. Manifestly then, hydramnion, clinically speaking, is applied to a condition in which the excess of liquor amnii is sufficient to cause symptoms. What are these symptoms?

Clinical History.—The subjective symptoms are for the most part the result of pressure. Pressure against the diaphragm causes a tormenting dyspnœa, pelvic pressure obstructs the return circulation, causing

or aggravating varicose veins and resulting in marked œdema of the feet and legs. Finally the intra-uterine pressure which results from the distention reflexly excites uterine contractions and these may become quite painful. Very often the cervical canal becomes obliterated but the thinned and paralyzed uterine muscle cannot accomplish the dilatation of the cervix and the patient's sufferings are indefinitely prolonged. The condition is similar to that which obtains in the latter weeks of twin-pregnancy.

Palpation gives results that are typical. The observant examiner will never fail to note the evidences of an excessive amount of amniotic fluid. The abdomen is distended and the fundus at a higher level than usual. Palpation of fetal parts is unsatisfactory but ballottement, both external and internal, is characteristic and very easy. The fœtus is very movable and external version can be performed without difficulty. As might be expected malpositions and malpresentations are very common, but, owing to the small size of the fœtus, this fact in itself is not of great clinical significance. The fetal heart sounds are feeble or absent. For this there are two reasons, the fact that the fœtus is usually premature or feeble, and the interposition of a large amount of water.

Of course these symptoms are not always present. And they are more easily borne when gradually developed than in the acute cases sometimes observed. After all it is not the mere fact of the presence of a large quantity of fluid, but the symptoms produced, which determine the necessity for interference. Patients differ greatly in their tolerance of the condition. One is often astonished to see a patient with an enormous accumulation of liquor amnii but showing no evidences of discomfort.

Etiology.—Hydramnion is often associated with some disease or deformity of the fœtus and its connection with twin-pregnancy is a matter of common observation. It has often been regarded as of fetal origin, due perhaps to stimulation of the nervous mechanism of the urinary secretion, as in spina bifida, from the fact that the cord is exposed or to some obstruction to the fetal placental circulation, *e.g.*, cardiac disease, knots in the cord, etc. It has also been attributed to disturbances of the maternal circulation, and to inflammation of the amnion itself. The occurrence of hydramnion as a complication of syphilis has already been noted.

On the whole we know little that is positive about the cause of hydramnion; nor is this to be wondered at. Since we do not as yet know the source of the liquor amnii in physiological pregnancy, it is not strange that we should find it difficult to account for its production in excess.

Treatment.—When the symptoms are moderate in degree, the patient merely suffering more or less discomfort, palliative measures must suffice. If, however, dyspnœa is marked or cardiac embarrassment supervenes, labor should be induced. In hydramnion this is an easy matter. The canal of the cervix has usually been obliterated and there is already some slight dilatation of the os. After the escape of the amniotic fluid, the

uterus rapidly regains its tone, the muscle becomes thicker, there is a rearrangement of its fibres, contraction and retraction go on normally, and labor is soon completed, or operative delivery, if necessary, easily accomplished. The attendant should not forget that there is a predisposition to hemorrhage in these cases.

OLIGO HYDRAMNION

By this term is meant an abnormally small quantity of amniotic fluid. Little is known as to the cause, though it has been associated by Jaggard with absence of the fetal kidneys, imperforate urethra, and various causes of retention or non-secretion of urine, and by Ahlfeld with morbid conditions of the skin, interfering with excretion. Occurring in early pregnancy, it is the cause of malformations and intra-uterine amputations already referred to. Later it causes the fetal movements to be felt much more plainly since there is no fluid medium to act as a buffer. In some cases they are quite painful. When in the latter months the uterus is very closely applied to the fetal surface, the compression may lead to club-foot, spinal curvature, wry neck, wrist drop, etc.

During labor, if the fluid is very much reduced in quantity, the conditions approximate those which obtain in cases of premature rupture of the membranes. The amniotic pouch, so effectual as a dilator, is lacking or insufficient. The uterine contractions are painful and ineffectual and artificial dilatation of the cervix may be necessary.

AMNIOTIC BANDS

In early pregnancy inflammation of the amnion may result in the production of firm adhesions between the amnion and the cutaneous surface of the fœtus and the production of deformities by restriction of growth. "Intra-uterine amputations" may be thus caused. Such cases constitute a fruitful source of "evidence" for those who believe in the occurrence of what are called maternal impressions. All that is needed is that the mother or some one of her friends shall have heard of some human being or animal with one arm or one leg and the evidence is, for a certain type of mind, complete.

We have already seen that adhesions between the amnion and the uterine wall may delay the first stage of labor. This important matter, so often neglected or overlooked, I have already referred to in connection with the subject of delayed labor.

B. THE PATHOLOGY OF LABOR

CHAPTER XVIII

ANOMALIES OF THE EXPELLENT FORCES

Abnormal labor, or dystocia, as it is technically called, has been variously classified. Perhaps the time-honored three-fold classification of the older writers remains the most satisfactory. According to this, we divide the many anomalies that must in a general way be the study of the obstetrician as follows:

1. Those which have to do with the expulsive forces. 2. Those which are of fetal origin, *e.g.,* structural anomalies of the fœtus and the various malpositions and malpresentations. 3. Those which are the result of malformations of the birth canal, *e.g.,* pelvic contraction, pelvic tumors, stenoses, etc.

All this was clearly expressed in the homely and vigorous phraseology of our fathers under the heading of anomalies of the powers, the passenger and the passages.

The casuist can pick flaws in this classification. He may say, for example, that a malposition is sometimes caused by a uterine anomaly, for example, a tumor, and this is quite true. But to this the reply is that classification is not an end in itself but rather a means to an end. Too much refinement in definition obscures rather than aids.

Anomalies in the Uterine Forces

Every practitioner who does much obstetric work soon learns that there are many variations from the regular course of normal labor, as I have tried to describe in Chapter VI. But not all these variations are to be regarded as pathological. Such an attitude leads to a pedantic and meddlesome policy that does not subserve the interests of the patient. As a general rule, the inexperienced and overanxious observer is more likely to discover what he considers abnormalities than is the experienced accoucheur. The course of labor may vary within wide limits without giving cause for anxiety. Ordinarily, it is only when such variations affect, or threaten to affect, the condition of mother or child that interference becomes necessary.

Irregularities in the force and effect of the uterine contractions are frequent in the early part of the first stage. In some cases irregular pains are a source of discomfort for days before the advent of true labor. Again, the pains may come at regular intervals, simulating closely those of true labor and continuing for several hours, only to die away after a time. The cervix will be found more or less dilated but as a rule the canal is not completely obliterated. Less commonly the first stage may

drag along for two or three days with little or no progress, but without great suffering or threatened exhaustion. In some cases contractions begin in the morning hours and continue until the middle of the day, the same process being repeated the next day.

It is not always possible to tell the cause of delay in these cases. To my mind they illustrate a truth that I have long taught, *viz.*, that there is no exact line of demarcation between pregnancy and labor. The explanation commonly invoked is that of uterine inertia. This much-abused term is too often used as a cloak for lack of skill in diagnosis or a euphemism to explain certain facts in connection with the physiology of labor of which we know as yet little or nothing. It has more than once been my lot to be called to see a supposed case of delayed labor, only to find that the pains were not typical of true labor and that while there was perhaps some dilatation of the cervix, the canal was not yet fully obliterated; in other words, that the patient was not in labor at all. To treat such a case actively, perhaps by manual dilatation and forceps or version, as is sometimes done, is a disastrous mistake. A severe operation is unnecessarily performed and perhaps with very unfortunate results for mother or child. The young physician will do well to make sure that labor is really in progress before adopting active measures.

But there is such a thing as uterine inertia, or powerlessness, which is what the term really means when used in the obstetrical sense, that deserves careful study. This incompetence of the uterus for its task may be due to many different factors of widely different kinds. The study of the subject is much facilitated by the division of uterine inertia into two classes: 1. Primary or Essential Inertia. 2. Secondary or Acquired Inertia.

PRIMARY INERTIA

By primary or essential inertia is meant an inability of the uterine muscle to perform its functions during labor, this inability being present before labor begins and having nothing to do *per se* with the various complications of labor. It is often said to be congenital or hereditary, but these terms usually mean only that we do not understand the real cause. True primary inertia is very rare indeed. Perhaps the nearest approach thereto which can actually be demonstrated is found in the case of certain non-rhachitic dwarfs with atrophic skeletal and muscular systems. The general practitioner, however, will meet with these cases but rarely.

It is a matter of every-day experience that stout women of the so-called lymphatic temperament often suffer from defective uterine action, but just why cannot be stated.

Congenital or unexplained defects in the uterine muscle or unexplained anomalies in uterine innervation we may imagine, but cannot explain.

That there is, however, in certain cases deficient contractile power in

the uterine muscle which manifests itself at the beginning of labor and for want of a better name may be called primary, essential, or idiopathic weakness, there can be no doubt. Used to describe this condition, the term uterine inertia is justifiable. The condition is to be distinguished from the so-called uterine inertia by the fact that the uterine contractions are frequent and ineffectual from the start, and by the further fact that no pathological condition in mother or child which might account for the condition can be found. Whatever the cause may be, it exists before the beginning of labor.

SECONDARY INERTIA

Secondary inertia is not a condition in itself, but the result of some other condition. Its causes are multiform and their recognition of great importance. When in the course of labor the uterine contractions cease or become absent or inefficient there is usually a demonstrable cause which can be found and remedied by one who has mastered the principles of obstetric diagnosis. This, however, is not always the case. The practitioner cannot always be blamed because he cannot find the cause of delay. There are occasional cases in which the symptoms tell us plainly that it is our duty to interfere but in which we are unable with the means now at our disposal to determine the cause of delay.

The more common causes of secondary inertia, or, better, of delayed labor, as far as we know them, may be grouped under three heads: Disturbances of innervation; mechanical causes; uterine exhaustion.

That psychical conditions influence the progress of labor is known to all practitioners. That the contractions are often temporarily arrested by some powerful emotion, or even by the arrival of the physician, or by the presence of meddlesome relatives or friends, is a matter of common observation. In these cases the innervation of the uterine muscle is reflexly disturbed.

Again, there is a class of cases in which uterine contraction is reflexly inhibited by the influence of pain and fear. Every practitioner soon becomes familiar with this variety. The patient is of the neurotic type, or perhaps of that peculiar type which, while well balanced in other respects, cannot bear pain well. She cries out at the approach of every pain and cannot be quieted even in the intervals. She appears to suffer acutely but makes little or no progress. Cervical dilatation is slow or ceases altogether. Position and presentation are normal, the head enters the brim easily, and careful exploration reveals no cause for delay. Here again the trouble is purely reflex, as is shown by the fact that the administration of chloral or some other hypnotic in sufficient dose promptly effects a cure.

But there are reflex causes of delay that have nothing to do with the nervous system. It is well known that a distended bladder often arrests

the progress of labor. That this delay cannot be altogether mechanical in origin is shown by the fact that the distended bladder does not occupy the pelvic cavity and, very conclusively, by the further fact that it prevents uterine contraction after delivery as well as before.

The same thing is true of an overloaded bowel, though to a much less extent. In this case the cause is partly mechanical, especially if the rectum is filled with hardened masses.

Facts like these are not only interesting, but of the highest practical value, since they at once suggest effective measures of treatment.

Then there is a class of cases in which the obstacle to uterine contraction is plainly and exclusively mechanical. The uterus cannot work to advantage on account of some mechanical interference. For example, in cases of hydramnion and twin pregnancy, the uterine muscle is so thinned and stretched that its contractions are feeble and ineffectual. The long first stage in these cases is proverbial. If, however, the membranes are ruptured and the uterus permitted to contract upon its contents, the contractions improve in force and frequency, and if the delay has not already been so great as to exhaust the uterine muscle, the second stage is rapidly completed.

In this class are included cases of pendulous abdomen or marked lateral deviation of the fundus to one side (lateroversion). That the uterus cannot work to advantage when its long axis is directed too far backward, as in pendulous abdomen, or too much to one side, as in lateroversion, requires no explanation. In the same category would come the various malpositions and malpresentations, unusual size of the fœtus, hydrocephalus, tumors, contracted pelves, etc. All of these are considered elsewhere. Uterine malformations and tumors may also constitute causes of delay.

Certain acquired conditions referable to the uterine muscle are sometimes cited as causes of inertia. Among these are chronic metritis and endometritis, and antepartum infection. Bumm believes that the uterine muscle may be the subject of a condition analogous to that which is observed in lumbago, torticollis, etc. (*rheumatismus uteri*), and has observed marked benefit from the use of the salicylates. Tumors may interfere with uterine contractions not only mechanically but by replacing the muscular structure, as in the case of fibroids, not only mechanically, as when the mass directly obstructs the birth canal, but also by replacing the muscular structure.

Rigidity of the Cervix

Rigidity of the cervix is often given as a cause of delayed labor and uterine exhaustion. In my opinion true rigidity of the cervix at term is very rare. Too often the term is used to mask ignorance of obstetric diagnosis, or, honestly enough, because of unfamiliarity with the pathology

of labor. One almost wishes that such terms as uterine inertia, and rigidity of the cervix, might be banished from the text-books. When the full term cervix refuses to dilate during labor, it is usually because the dilating force fails, or is not properly applied. This is shown by the fact that the cervix in these cases almost always yields to manual dilatation, even though no great force is used.

When the cervix does not dilate a careful examination will usually disclose the cause. It may prove to be an unsuspected contraction of the pelvis or some malposition or malpresentation. Premature rupture of the membranes is a common cause. I have often found it to be a posterior position of the occiput. I recall a case which I was once asked to see and which had previously been seen by a well-known gynæcologist. The latter had made a diagnosis of rigidity of the cervix. Examination revealed a posterior position of the occiput. Thus the non-dilatation of the cervix was readily explained and the remedy suggested.

The cervix, like the other soft parts, is somewhat more resistant in primiparæ of middle age than in younger women, but even in these cases manual dilatation can usually be accomplished without trouble.

It must be admitted, however, and this is an important clinical fact commonly overlooked, that the cervix is sometimes very resistant in cases of premature labor. In these cases it may be impossible to secure immediate dilatation by the employment of any force that is justifiable, even after the cervical canal has been obliterated.

In certain cases the cause of delay and of non-dilatation is to be found in the fact that the amnion is adherent to the uterine wall and that for this reason the presenting segment of the amniotic sac is prevented from entering the cervix. The difficulty may be speedily removed by separating the membranes from the uterine wall with the finger.

A short umbilical cord may also prevent the descent of the fœtus. The delay is easily accounted for after delivery, but during labor it is hardly possible to make a positive diagnosis.

At the last analysis, however, secondary inertia is usually nothing more nor less than uterine exhaustion. Like other muscles, the muscle of the uterus may become so exhausted by long and hard work that it responds but feebly to ordinary stimuli. If no rest is afforded, it may finally fail to respond to any stimuli. These conditions are called, respectively, incomplete and complete uterine inertia. The fruitless efforts of the uterus to overcome some mechanical condition or obstacle are at the root of the trouble. It is not that the uterus is too weak, but that the obstacle is too strong.

The cause is almost always some one of the conditions already mentioned. Among these are all kinds of pelvic deformity, all malpositions and malpresentations, tumors blocking the pelvic cavity, etc. In premature rupture of the membranes the uncovered fetal head, a poor dilator of the cervix, is substituted for nature's ideal dilator, the "bag of waters."

Here, unaided, nature may be unable to accomplish the task, especially if the head is large.

In my experience the most frequent factors in every-day practice, and those most commonly overlooked, are posterior positions of the occiput and unusual size of the fetal head. Inertia uteri is not as common as formerly and marked degrees seldom occur in the practice of those who practise modern methods.

Hofmeier has recently maintained that certain cases of apparent inertia following difficult labor are not due to exhaustion, but to the fact that the uterus reaches its limit of retraction, and thus of its propelling force, long before labor is complete. However this may be, the symptoms and the indications for treatment are the same.

In the second stage of labor the abdominal muscles come into play. Inertia of these muscles may be due to the exhaustion resulting from a long first or second stage, to general muscular weakness, to exhausting disease, or to overdistention of the abdomen, as in the case of twin-pregnancy or hydramnion. Again there may be a mechanical cause, as diastasis recti, or pendulous abdomen. All the malpositions may act as causes. A short umbilical cord is an occasional source of delay. Contraction at the pelvic outlet is often overlooked by those who do not practise pelvimetry. Fear of pain leads some patients to resist bearing-down efforts. A distended bladder may delay labor in the second stage, although its influence is less powerful than in the first. The improper or excessive use of narcotics or anæsthetics may have the same effect. The average prolongation of the second stage in the " twilight sleep " is one hour. Late primiparity is a factor.

Clinical History.—In primary inertia the contractions are weak and infrequent from the beginning of labor. The patient may belong to one of the types already mentioned as illustrating the condition. Primary inertia, however, is not necessarily a part of general muscular weakness, since it may be present in strong and apparently healthy women, whereas every physician knows that weak and anæmic women often have powerful uterine contractions.

In secondary inertia the symptoms indicative of the condition do not appear until after some hours of good labor pains. The contractions which have hitherto been strong become weaker. In some cases the contraction begins normally but is of very short duration. The uterine muscle, unequal to its task, relaxes in a few seconds. The hand which has become accustomed to palpating the uterus during the contractions of normal labor (and the young physician should not neglect his opportunities in this respect) at once recognizes the difference.

At the same time examination shows that the head is not descending, and that dilatation of the cervix is not progressing. There is usually a marked change in the psychical condition of the patient. It is my observation that intelligent women, especially those who have had children

before, often recognize the condition themselves. I am in the habit of paying considerable attention to the statements of such patients. This matter is further discussed in connection with the forceps operation.

The character of the contractions that precede uterine exhaustion at once attracts the attention of the experienced accoucheur. They are accompanied by suffering that is severe and at times intolerable. In normal labor the head descends and recedes alternately and while the pains are severe there are frequent intervals of relief. When, however, progress ceases and the uterine contractions continue, the results of long-continued reciprocal pressure between the fetal head and the adjacent structures are shown in the intolerable severity of the "pains" and in the fact that the patient does not experience complete relief even in the intervals.

If relief is not afforded the contractions gradually grow weaker and perhaps cease altogether. The hand placed over the uterus recognizes the change at once. The fetal parts are palpable even between the contractions, and through the relaxed uterine wall the fetal heart sounds may be heard, not only between the contractions, but during the contractions themselves. After a time the uterine muscle ceases to respond to any reflex irritation and even massage of the fundus has no effect. The abdominal muscles have also become inert and incapable of further work and coils of intestine can be traced between abdomen and uterus. The vagina becomes hot and dry, and after a time the venous congestion below the "circle of contact" of the presenting part leads to capillary rupture, which is signalized by a brownish-red discharge from the vagina. This discharge was considered by the older writers to be a signal for interference. We know now that it is a sign that interference has been too long delayed. The temperature is subfebrile, one hundred or thereabouts, though it may be normal, and there is a steady rise in the pulse-rate.

Thanks to the progress of obstetric science this melancholy picture has been all but banished from sick-room and hospital. He who would allow one of his patients to reach this stage should adopt some other calling than that of the obstetrician.

Treatment.—The treatment of delayed labor is a comprehensive subject, involving as it does the treatment, preventive and curative, of most of the complications of labor. Since, however, the evidences of uterine exhaustion and the indications for interference are to a large extent the same in all cases, and in particular, since we may not know the cause of delay, it may be well to consider here certain general principles of treatment that are applicable to all cases alike.

In the class of cases mentioned above, in which irregular pains precede the development of active labor, I have sometimes found the cause to be an overloaded intestine. In this case the administration of a cathartic at once relieves the symptoms. Castor oil should not be given unless the attendant is satisfied that the patient is at term and that the beginning of labor is desirable. If he has reason to believe that this is not the case

a saline cathartic and an enema of olive oil are to be preferred. A simple anodyne, *e.g.*, a full dose of codeine at bed-time, often works wonders by securing the patient a good night's sleep.

In some cases the patient will have regular contractions attended by considerable pain and continuing for several hours, only to cease and reappear the following day. I have found this condition so common, especially in hospital practice, that I have ceased to regard it as pathological. It is in some cases a kind of prelude to labor. Examination shows no abnormality and active treatment does more harm than good.

But suppose that labor has really begun, as shown by continuous and regularly recurring pains, and by complete obliteration of the cervical canal, but does not progress as rapidly as one would like. What then?

In the first place it is of the utmost importance that the beginner should at the outset rid his mind of the idea that a slow labor or even a delayed labor necessarily indicates active treatment or surgical interference. The thinking man soon learns to recognize that the problem is not one of hours or even days but of the condition of mother or child. I cannot agree, however, with those who would postpone interference until unmistakable signs of exhaustion are present. To wait until this time may be to wait until irremediable harm has been done. It should be the aim of the obstetrician to learn how to recognize in advance conditions that are certain to require interference, and to anticipate the symptoms of exhaustion. This subject is discussed in connection with the forceps operation and need not be considered here.

It is highly important that the beginner should know what not to do. He should not subject the patient to internal examinations, frequently repeated, and continued over a long interval. It is in just these cases that such examinations are often insufficient even for the trained specialist, and as pointed out in the chapter on normal labor they may do incalculable harm. If no immediate danger to mother or child is apparent it is better for the attendant to content himself with such general measures as have been already described, especially those which conduce to the relief of suffering, and to wait patiently upon the efforts of nature, meanwhile, however, watching the patient carefully, not absenting himself too long, and occasionally auscultating the fetal heart.

Whenever the attendant becomes satisfied that all is not as it should be, he should proceed calmly and deliberately to find the cause. An enema should be given and the bladder should be emptied with care. The patient is now anæsthetized and brought to the edge of the bed or table and examined, the half-hand being used if necessary. It is better to use a table, since an operation of some kind may be required. Meanwhile every preparation for an operation should be made as described elsewhere (p. 541). In this way if an operation is deemed necessary it may be performed without delay and the danger of repeated anæsthesias and additional manipulation is avoided. Even though no serious operative

procedure is demanded, it will often be found that the temporary relief from suffering and the relaxation resulting from the anæsthesia, aided perhaps by some manipulation such as the rupture of the membranes or a partial manual dilatation, will suffice to bring labor to a happy termination.

If the examination reveals, as it may, some definite complication which is plainly the cause of delay, *e.g.*, an unsuspected contraction of the pelvis, some malpresentation, or perhaps unusual size of the fetal head (the latter is difficult to determine), it is to be promptly treated by the rules laid down elsewhere.

If the case is of the neurotic type, in which there is reflex inhibition of uterine contractions through nervousness and fear, the happiest results are often obtained by the exhibition of chloral in fifteen-grain doses. More than one dose is seldom required. Under the influence of this drug the pain becomes less severe, the patient dozes in the intervals between contractions, and dilatation often proceeds with unexpected rapidity. Morphine, narcophen, or pantopon, hypodermically, may be given if preferred, or morphine and hyoscine in combination. The inexperienced worker, however, is warned against the endeavor to narcotize the patient during the whole course of labor. This involves considerable risk to the child. Much may be accomplished during the second stage by giving a few drops of ether with each pain.

A partial manual dilatation under anæsthesia is often of the greatest service in these cases. Of course this should not be undertaken unless the cervical canal has been obliterated and the cervix is soft and distensible. If, after dilatation, the membranes are ruptured and the amniotic fluid allowed to escape, the uterus contracts upon the fœtus and the reflex impulse to "bear down" soon becomes irresistible.

In all cases, however, the attendant should first endeavor to satisfy himself that he is not overlooking some mechanical obstruction in the way of pelvic contraction, posterior occiput, etc.

If the case is one of premature rupture of the membranes, a long and tedious labor may usually be expected. The uncovered fetal head is a poor dilator of the cervix. The danger of infection is increased, since there is a tendency to decomposition of the retained liquor amnii, and, if operative interference becomes necessary, there is an increased likelihood of cervical laceration. The prolongation of the labor and the fact that the uterus presses directly upon the fœtus, the protective fluid medium being absent, enhance the danger to the child. All these dangers are best avoided by the introduction of a de Ribes bag within the cervix. In this way nature's method of hydrostatic dilatation is closely imitated, and the outflow of the retained amniotic fluid in part at least prevented.

In these cases the fetal heart should be carefully watched, and the second stage not allowed to linger too long.

But the difficulty may be an excess of amniotic fluid, as in twin labor or hydramnion. Here the remedy is the artificial rupture of the mem-

branes. This accomplished, the thinned and distended uterine wall regains its tonicity and delivery occurs speedily or is easily accomplished by the forceps.

In many other cases, too, all that is needed is the artificial rupture of the membranes. As Bumm has observed, this is especially apt to be effectual in multiparæ with lax and atrophied abdominal and uterine walls. But it is a measure which must be employed with discrimination and judgment. The subject is discussed in the chapter on the management of normal labor.

Pituitrin.—In pituitrin, the extract of the pituitary gland, we now have the most effectual method of stimulating uterine contraction during labor. Unlike ergot, the use of which has often proved disastrous, it does not cause tonic and continuous contraction. The contractions, while much increased in force and frequency, are, like those of normal labor, intermittent and succeeded by intervals of repose. The speed and certainty of its action are often remarkable. I have seen a delayed second stage, which promised to require the forceps, terminated in five or ten minutes, and this without the slightest untoward incident.

It is apparent that the use of so powerful an agent as pituitrin must be attended by certain dangers and that certain precautions are necessary. As a rule, it should not be employed during the first stage, though occasional exceptions may be allowed to the experienced operator. Its use in the presence of a rigid or but slightly dilated cervix, in pelvic contraction, or in any case of mechanical obstruction, might, and indeed has, resulted in rupture of the uterus. It is also reasonable to suppose that under these circumstances the danger to the fœtus would be greatly increased, and this has been shown to be the case.

Pituitrin markedly increases the blood-pressure and would therefore seem to be contra-indicated in cardiac, renal, or eclamptic conditions. I am not satisfied that this is always true, since unfavorable by-effects may always be modified by the use of an anæsthetic.

The chief field for pituitrin is in delay in the second stage of labor. Here it is an agent of great value and often renders the forceps operation unnecessary. This is especially desirable in the case of the physician who is without assistance and in surroundings that render careful and aseptic work difficult or impossible. Under these circumstances the tedium and uncertainty of a delayed second stage are speedily terminated and the scene changes in a way to reward physician and patient alike. This is especially true of delayed second stage.

The physician should not forget that the contractions evoked by this agent are often prolonged and powerful. He should watch the fetal heart and should guard against too rapid expulsion with accompanying laceration. If the contractions become too violent they may be promptly controlled by the administration of an anæsthetic, which should always be at hand when one administers pituitrin. Indeed, one of the best methods

of painlessly completing a delayed second stage is to give pituitrin and control its administration by minimal doses of chloroform or ether. It is necessary that the attendant should secure a reliable preparation. I have found that of Burroughs & Wellcome very satisfactory.

It is important to remember that the very property of pituitrin which renders it so useful in the second stage of labor makes it of less value in the treatment of hemorrhage. Pituitrin causes alternate contraction and relaxation of the uterus, and bleeding may occur during the periods of relaxation. Moreover the powerful contractions are, according to some writers, followed by a period of uterine atony, which is in itself a cause of hemorrhage. Some practitioners and writers seem to have conceived the idea that after pituitrin has been administered security against hemorrhage has been attained. This is a grave error. *In all doubtful cases ergot should also be given.* The permanent tonic contraction which it causes is exactly what is needed in these cases and we have as yet no drug which can take its place.

Experience shows that pituitrin has little or no effect in bringing on labor. Attempts to induce labor with this agent have been failures. It is, however, very valuable as an aid to the process of induction. In this operation, by whatever method performed, success is not always brilliant. After the cervix has become dilated to the extent of admitting perhaps two fingers, the contractions may cease and renewed efforts prove unsuccessful, leaving the physician in a most embarrassing position. Here pituitrin is most useful in completing the process. Of course, the attendant should endeavor to satisfy himself that no contra-indication is present. According to Rongy and Arluck bad results are not observed here because the uterine wall is thick and the contractions evoked are not of violent character. Then, too, the fœtus is often small.

Ergot is seldom or never used nowadays until the placenta has been expelled or its expulsion within a few minutes seems certain. Its tendency to produce permanent tonic contraction, thus endangering the life of the fœtus or causing retention of the placenta, has long been well known. For uterine inertia during the third stage it is, as we have seen, an incomparable remedy. It is also very useful in the treatment of abortion, in which hemorrhage is an ever-present danger, and the preservation of fetal life does not enter into the question.

Quinine in large doses is warmly advocated by some as a remedy for the inertia of the second stage. It has seemed to me to be more successful in malarial subjects or in malarial regions. At all events it is sometimes successful and at other times fails completely. A large dose, fifteen or twenty grains, is necessary. In the absence of pituitrin and under the above circumstances it is well worth a trial.

Strychnia is sometimes given during the latter weeks of pregnancy with the idea of stimulating the uterine muscle to good contractions during labor. Its efficacy is problematical.

Expressio fœtus, after Kristeller's method, is sufficiently illustrated in Fig. 208. It is sometimes effectual when the head is on the pelvic floor. At other times it is not successful. One can only tell by trying. This method is of great value in the case of premature children and of twins, especially of the second twin. In these cases it may be used even when the head is high, provided that the cervix is fully dilated. It is of little or no value when the fœtus is large.

Posture.—Much complicated advice of doubtful value has been given upon this subject. Experience has taught me that there are two or three points of special value to the practitioner. As a general thing, it is better that the patient should be up and about during the first stage. The

Fig. 208.—Kristeller's expression of fœtus. (DeLee, W. B. Saunders Co.)

friction of the abdominal walls against the uterus is said to provoke contractions, and gravity may have some effect. Moreover, nature and experience alike teach that this attitude is the natural one. If, however, the patient is weak or exhausted from loss of sleep or other causes, it is better for her to remain quietly in bed, and perhaps to receive some anodyne.

In the second stage the contractions may be stimulated by having the patient turn upon the side opposite to that toward which the fundus is directed. This causes the fundus to approximate the median line and brings the head directly into the middle of the pelvis. I have often witnessed the efficacy of this manœuvre.

Excessive Uterine Retraction. The Ring of Bandl

As we have already seen, the uterus retracts during labor, drawing the cervix up over the head, not pushing the head down through the cervix. When for some reason, *e.g.*, pelvic contraction, or some malposition or malpresentation, this cannot be accomplished, the continuance of uterine retraction causes the lower uterine segment to become dangerously thinned and stretched while the corpus uteri becomes correspondingly shorter and thicker. At the junction of the corpus with the lower segment is felt a muscular ridge not discernible in normal labor. The more the lower segment becomes stretched the higher this ridge is above the symphysis.

The ridge is known as the ring of Bandl, from the man who first recognized its nature and taught its significance. When it can be plainly felt above the symphysis, it may be assumed that there is some obstruction to the progress of labor, and of course the higher it ascends, the greater the urgency of the case. Strictly speaking, it is not a ring but is felt as a ridge extending somewhat obliquely across the lower abdomen above the symphysis. It often occurs while the membranes are still intact. It is to be regarded as the result of long-continued but fruitless effort on the part of the uterus to overcome some obstruction or obstacle.

Many students regard the formation of the ring of Bandl as an obscure phenomenon of little practical interest. This is a great mistake. Whenever the ring is found well marked above the symphysis the danger of rupture of the uterus should be borne in mind, and treatment should be promptly instituted.

Tetanic Contraction of the Uterus

Safety to the fœtus and some degree of relief for the mother are insured by the fact that in normal labor an interval of rest follows every uterine contraction. Now and then, fortunately not often, the uterus becomes tonically contracted, *i.e.*, the intervals are absent, and it may be a long time, even hours, before relaxation occurs. This tonic contraction is most often observed as the result of ergot, though it may occur as the result of irritation from repeated unsuccessful attempts at delivery, or when the fœtus has long pressed against the uterine wall, as in neglected transverse presentation, or in premature rupture of the membrane. It is to be distinguished from retraction by the fact that the ring of Bandl is not to be felt.

This tonic contraction, however, does not always involve the whole uterus. It may involve a circular segment of the uterine wall at any point. It is then called a constriction ring and is most common at the external or internal os. In the first stage it involves the external os and is probably accountable for most of the cases of so-called rigid cervix. In the third stage it is represented by the well-known hour-glass contraction, which

was so often the result of the ill-timed use of ergot, but may result from premature and unskilful efforts at placental expression.

In this condition a constricting ring separating the upper and lower uterine segments causes the latter to assume the shape of an inverted funnel, and the inexperienced accoucheur may even think he has passed his hand into the uterine cavity when in fact he has only entered the distended cervix and lower segment.

The treatment of the various forms of abnormal contraction and retraction of the uterus during labor is discussed in connection with version, hour-glass contraction, etc. In a general way it may be said to be the administration of an anæsthetic and the performance of whatever operation is indicated. In certain cases of annular constriction, *e.g.,* in hour-glass contraction, or when the cervix contracts about the neck and imprisons the after-coming head of a dead child, it may be only necessary to wait until natural relaxation occurs.

Precipitate Labor

Much less common than delayed labor is precipitate labor. In this form a veritable storm of powerful contractions suffices to propel the fœtus through the pelvic canal in an incredibly short time. So powerful and irresistible, indeed, are the muscular contractions of the second stage that child, fæces and urine may be expelled at the same time. There is hardly any interval between contractions, and the patient becomes breathless and cyanotic from the constant straining and "bearing down." The clinical picture is characteristic and unmistakable.

This is true "precipitate labor." The cause is not well understood but is probably some unexplained anomaly of uterine innervation. Under the same head are usually included many cases in which the chief feature of labor is its rapidity, though the character of the contractions is less distinctive. In this category belong most of the "street births." Rapid labor is much more common in multiparæ. Now and then a patient will be awakened in the middle of the night by the rupture of the membranes and two or three "pains" will suffice to complete labor. It is not safe, however, to conclude that it never occurs in primiparæ.

Rapid labor is favored by multiparity, by a lax condition of the soft parts, and by small size of the child. It does not seem to depend to any great extent upon general muscular development. Many anæmic and apparently delicate women have rapid and easy labors. The common idea that a roomy pelvis causes rapid labor has little foundation. In primiparæ the head has passed the pelvic brim and descended into the cavity long before the beginning of labor.

Rapid labor is not always an advantage to the patient. Syncope may follow the sudden diminution of the intra-abdominal pressure, and the sudden emptying of the uterus predisposes to hemorrhage. But these

dangers are not usually very serious. More real is the danger of laceration of the soft parts, since there is no time for the slow and gradual distention so necessary to their preservation from injury.

It should not be forgotten that in these cases there is an increased risk of infection. Long ago my attention was drawn to this fact in the course of out-patient maternity practice. The reason is plain. The child is usually born in the absence of a physician or competent nurse, and all manipulations are made by unskilled and non-disinfected hands. There is an important lesson here for physicians who are called to such cases or who happen to be present. There is usually no great occasion for haste and, in the absence of hemorrhage or fetal asphyxia, full time should be taken for the necessary aseptic precautions.

Treatment.—For the condition itself the treatment *par excellence* is the administration of an anæsthetic. The patient should be turned upon her side in order to weaken the force of the abdominal contractions, and the too rapid exit of the head prevented by the measures described and illustrated in connection with the subject of the prevention of perineal lacerations. Special care should be taken to guard against infection and hemorrhage.

CHAPTER XIX

MALPOSITIONS AND MALPRESENTATIONS OF THE FŒTUS

In normal labor nature provides that the fetal head shall present by its smallest diameter, the suboccipito-bregmatic. In studying the mechanism of labor we have seen that under favorable conditions the well-flexed head enters the pelvis with the occiput obliquely anterior, and that with the progress of labor the occiput rotates forward, until during the stage of expulsion it is found directly under the pubic arch. It is only in this way that the smallest diameter is made to present at the superior strait and at the outlet. All cases in which this diameter does not so present are theoretically abnormal, and often, though not always, lead to delay in labor and require the assistance of art.

All cephalic malpresentations are attended by undue extension of the head and consequently by an increase in the diameter of engagement. For example, in occiput posterior cases the occipito-frontal or suboccipito-frontal diameter is substituted for the suboccipito-bregmatic, and in face and brow presentations still other and longer diameters are substituted. All this is shown in the accompanying figures. The Germans very appropriately call these the *Deflexionslagen* (extension positions).

A conception of the important fact that all these malpresentations simply represent different degrees of extension does much to simplify the subject. My experience has taught me that those who try to master each subject separately end by mastering none.

Of all abnormalities of vertex presentation by far the most common and, for that reason, the most important, is the posterior rotation of the occiput. This complication is one of the most common causes of delayed labor, and its non-recognition may be followed by disastrous consequences. In my experience the most common condition which the obstetric consultant is called upon to treat is unrecognized posterior position of the occiput. And yet the subject in its essentials is simple enough, and opportunities for clinical observation are frequent. Every one who intends to make obstetrics a part of his work is in duty bound to give the matter careful attention.

Etiology.—Why does the occiput fail to rotate forward? The subject is somewhat obscure but it seems plain that a posterior occiput is usually associated with deficient flexion, and we know that the latter is usually the result of disproportion in size between the head and the pelvis.

Personally, I am inclined to believe that the size of the fetal head is an important factor, since clinical experience has taught me that in a large

proportion of the cases, in which the occiput is posterior and in which labor is so long delayed that interference becomes necessary, the fetal head is of more than average size. It is reasonable to suppose that a moderate contraction of the pelvic brim would have the same effect in the case of a head of normal size. Then, too, a small, *e.g.,* a premature, head may enter the brim and traverse the birth canal in almost any position. These cases of course offer little or no difficulty and the complication is nominal rather than real.

Among other causes that have been suggested are conditions involving a faulty deviation of the uterine axis, *e.g.,* extreme latero-version, pendulous abdomen, etc., all of which may modify the position of the head at the brim, uterine or pelvic tumors that may mechanically prevent rotation, prolapse of hand or arm in front of the occiput, etc.

It is obvious that inefficient pains and a lax pelvic floor may act as contributing causes, *i.e.,* may help to prevent the forward rotation of an occiput already posterior.

Frequency.—Occiput posterior cases are much more common than is usually supposed. This, I believe, is the experience of all those who, with out-door maternity services at their command, have given careful attention to the antepartum examination. The right posterior position is especially frequent, occurring in perhaps 30 per cent. of all cases. The left posterior position is much less frequent, though by no means an obstetric curiosity, as is sometimes asserted. I have met with it many times and believe that it is frequently overlooked. Of course, these estimates apply only to patients not yet in labor, and in the majority of cases rotation occurs during labor. Nevertheless, the proportion of cases in which anterior rotation is delayed long enough to cause symptoms or to require treatment is considerable. It has been estimated at 10 per cent. My own experience leads me to believe that this estimate is too low.

Mechanism and Causes of Delay.—After all, what concerns us here is not the original cause of posterior positions, but the reason for the delay in labor.

The delay in the first stage is easily accounted for. We have already seen that there is usually a disproportion in size between the head and the pelvis. Let us suppose that an over-large head oscillates above the pelvic brim for a time and then settles down with the occiput posterior. Here the long biparietal diameter of the head is opposed to the short sacro-cotyloid diameter of the pelvis; just the opposite of what should be the case. This is shown in Figs. 209 and 210. In some cases the disproportion prevents the engagement of the head, the cervix dilates slowly and incompletely, and the progress of labor is arrested with the head still above the brim.

Here we have a very interesting illustration of the fact that a knowledge of the mechanism of labor is essential to any correct theory of treatment. It is obvious that when the head is floating above the brim and its

descent is hindered by a distinct disproportion between the presenting diameter and the segment of the brim through which it must pass, if it passes at all, the use of the forceps is not indicated. The effort to deliver would be, and indeed many times has been, simply the setting of force against force with slight chance of success and large probability of disaster.

FIG. 209.

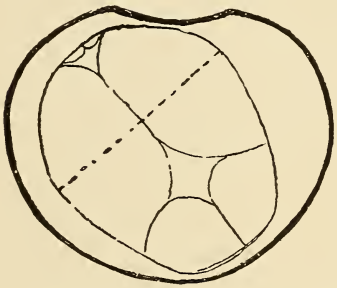


FIG. 210.

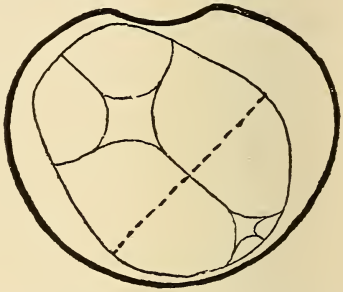


FIG. 209.—Head presenting at brim; occiput behind; biparietal diameter lying behind oblique diameter of pelvis. (Herman's Difficult Labor, Wm. Wood & Co.)
FIG. 210.—Head presenting at brim; occiput in front; biparietal diameter lying in oblique diameter of pelvis. (Herman's Difficult Labor, Wm. Wood & Co.)

Much more commonly the head passes the brim and enters the cavity of the pelvis. The mechanism by which the head is brought to the floor of the pelvis is the same as that which obtains in anterior positions, except, of course, that the occiput is obliged to rotate around an arc of 135 degrees, three times as far as in anterior positions. Nature is usually equal to the task but in a considerable proportion of cases anterior rotation does not occur. Just why is a matter of dispute. To my mind the large size of the head is still an important factor, as I have found that in most of my operative cases the head was large. It certainly demands a greater effort on the part of the natural forces to flex and rotate a large head than a small one.

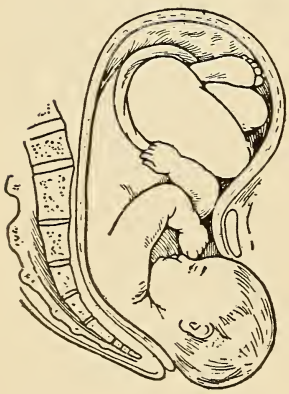


FIG. 211.—Showing mode of delivery when occiput does not rotate forward. (Herman's Difficult Labor, Wm. Wood & Co.)

Sometimes these efforts succeed in rotating the head to a transverse position and no farther. In a small proportion of cases, perhaps 3 per cent., the occiput rotates into the hollow of the sacrum.

In the latter case the mechanism of expulsion is a complete reversal of that obtaining in anterior positions. The occiput, which remains posterior, causes the peritoneum to bulge and the head continues to descend until the brow appears under the pubic arch. The head is now born by a movement of extension, the forehead, nose, etc., successively appearing, sometimes to the great surprise of the careless observer.

It is easy to see by reference to Fig. 211 that the delay in the expulsive

stage is due to the fact that the suboccipito-frontal diameter is substituted for the shorter suboccipito-bregmatic.

Variations from this typical mechanism sometimes occur. In some cases the brow is born first, the root of the nose impinging upon the symphysis. The occiput is then pushed through the vulva by a movement of flexion, which is often made with a sudden jerk and markedly endangers the perineum. The diameter of engagement is the occipito-frontal.

This mechanism indicates, indeed it is dependent upon, incomplete flexion and approaches somewhat the mechanism of brow presentation. The German writers give these cases a class by themselves, "top-head" presentation (*Vorderhauptslage*), but English and American writers have not thought it worth while further to complicate the matter.

Thus we need not wonder that the perineum is subjected to a severe strain and that lacerations are common, though I have not found them as frequent or as severe as is commonly asserted. Perhaps this is due to the fact that formerly the most difficult cases, *i.e.,* those in which the fetal head was over-large, were not rotated anteriorly by the forceps. If, however, the operator, not recognizing the cause of delay, undertakes to deliver by force, severe lacerations, even those of the third degree, are by no means uncommon.

Diagnosis and Clinical History.—In the first stage external examination is of the greatest possible value. The methods are given in the chapter on the antepartum examination. When we recall the fact that the R. O. P. position is next in frequency to the L. O. A., and that it occurs in 30 per cent. of all cases, it becomes apparent that every man has abundant opportunity to perfect himself in this method of diagnosis and that neglect in this respect is inexcusable. If there is no unusual thickness of the abdominal wall the task is easy.

Hence the following rule: In all cases in which the fetal back is found upon the right side the probability of a right posterior position should be borne in mind, especially if there are evidences of delayed labor. In the R. O. A. position the fetal back is near the median line and the fetal heart-sounds are heard near that line, nearer even than in the L. O. A. position. It is evident that the greater the distance of these from the median line, the greater is the probability of a posterior position. In well-marked cases the back may be palpated and the fetal heart-sounds best heard far around in the flank. Whenever the physician has an opportunity to examine his patient before labor, he should not fail to seek for evidences of a posterior position. At this time he can make it out at his leisure and more easily than when the patient is in labor. Thus will he be better prepared to determine the causes of delay when labor has really begun.

In left posterior positions the diagnosis is the same, *mutatis mutandis,* as in right posterior—but we must not forget that in left anterior positions the back is palpated and the maximum intensity of the fetal heart-sounds found at a greater distance from the median line than in the right anterior.

In no instance are the advantages of external examination better exemplified.

With the head above the brim, internal examination will require perhaps the introduction of the half hand or even the whole hand. This in turn requires an anæsthetic, increases the risk of sepsis, and is not justifiable unless the symptoms are such as to demand intervention. In that case the internal examination is used to confirm the external and, as the usual treatment is version, the latter may be performed without the withdrawal of the hand.

When the head has reached the floor of the pelvis, or is well down in the cavity, external examination gives less satisfactory results, and we are obliged to rely chiefly upon the results of internal examination. The large soft anterior fontanelle is felt obliquely anterior, *i.e.,* in one or the other iliac fossa, usually the right, while the small fontanelle is posterior and difficult to reach; just the opposite of what obtains in anterior positions.

The diagnosis, however, is sometimes difficult even for the experienced. If there has been much delay the scalp tissues may be swollen and the sutures difficult or impossible of recognition. In these cases there is one infallible method—the introduction of the half hand into the cavity of the sacrum and the palpation of the posterior ear. If the ear points posteriorly so must the occiput, and if the ear points to the right or left, so must the occiput. This method I have many times found most useful.

Let me pause here to impress upon the minds of all who are interested in this subject the importance of learning how to diagnose posterior positions of the occiput. The subject has been generally neglected. Failure in this respect may be fraught with the most unfortunate consequences. An impacted posterior occiput wrongly treated is one of the tragedies of obstetrics. The application of the forceps in unrecognized occiput posterior cases and the succeeding unskilful attempts at delivery have often resulted disastrously, as I have myself seen more than once.

Effect Upon Labor.—In about 90 per cent. of these cases, *i.e.,* in the cases in which the occiput rotates to the front without difficulty or delay, the clinical history does not differ from that of ordinary uncomplicated labor. In the balance of the cases the history is that of delayed labor, and in unrecognized or neglected cases that of uterine exhaustion.

If the head cannot enter the brim the first stage is prolonged and the suffering severe, as it always is when there is long-continued reciprocal pressure between the head and the bony pelvis. The cervix dilates slowly and incompletely and finally dilatation ceases altogether.

Complete arrest may take place in the mid-pelvis or, much more commonly, at the pelvic floor. In these cases the impression one gets is that the natural forces are sufficient but are working in the face of some insuperable obstacle. In spite of uterine contractions that are normal in force and frequency, and are aided by desperate efforts of the patient,

no progress is made, and the conclusion is forced upon even the most indifferent or careless observer that interference is not only justified but imperatively demanded. Sometimes rotation occurs at the last moment and contrary to all expectation, but this happy result cannot always be depended upon.

In the first place it is a mistake to suppose that every occiput posterior case needs active treatment or operative interference. Nothing could be more ill-advised or mischievous. In the great majority of cases the efforts of nature are sufficient to bring about a happy termination. The attitude of the physician, then, in cases of delay should be one of watchful attention. Something may be done by keeping the bladder and rectum empty, by having the patient lie upon the side toward which the occiput is directed, and by the cautious use of anodynes, for the relief of excessive suffering. If the condition of the mother remains good, the physician will not make haste to interfere, even though progress be slow. On the other hand, however, he will not permit the development of maternal exhaustion and will not neglect to keep himself informed as to the condition of the fœtus.

Assuming then that delivery is indicated, the treatment will vary with the position of the fetal head. If it remains above the brim the proper treatment, as we have already seen, is version. The difficulties of the high forceps operation are sufficiently great in anterior positions, and in posterior positions they are vastly increased.

Manual rotation of the head above the brim to an anterior position has been advocated, but an anæsthetic is required and the posterior position is likely to recur, making version necessary in the end. Moreover, this high rotation is about as formidable an operation as is an easy version.

If the head passes the brim but is arrested in the pelvic cavity version may still be practicable and, if so, is safer than an attempt to deliver with the old model forceps, if one is not an expert at forceps delivery. If, however, the operator is provided with an axis traction forceps and understands its use, the blades should be applied to the sides of the head, or as nearly as possible, and moderate traction made, aided by supra-pubic pressure. In this way descent can usually be effected and as a rule the occiput will rotate forward as it reaches the pelvic floor. This rotation may be encouraged by imparting a rotary motion to the true handles while making traction upon the traction handles. No great force should be used. In no condition is the wonderful efficiency of the Tarnier instrument better illustrated than here. I have performed this manœuvre many times with the greatest satisfaction. Before the forceps are removed simple pressure upon the fundus suffices to complete rotation.

In the great majority of cases, however, the head has reached the cavity of the pelvis before progress is arrested. In these cases an ordinary forceps may be applied and the head rotated. A straight forceps, or one with a very moderate pelvic curve, is to be preferred. This is a good

illustration of the fact that the practitioner should be provided with two pairs of forceps. The procedure is fully described in the chapter on the forceps operation, *q.v.*

Manual rotation of the head by the hand in the vagina is advised and practised by many. The external hand is applied to the abdominal wall and aids the manœuvre by pushing the posterior shoulder in the direction in which it is desired to rotate the head. The forceps are then applied. I have not found it necessary to practise this method, because it is much less certain than rotation with the forceps, and I have been uniformly successful with the latter, but there is no doubt that it is sometimes

FIG. 212.—Delivery in the occipito-sacral position.

FIG. 213.—Delivery in posterior position. External restitution.

successful. It is a useful expedient in case the operator does not have a Tarnier forceps, or has not the necessary experience or confidence to rotate the head with the ordinary instrument. The introduction of the hand into the vagina, especially if the operator has a large hand and the patient is a primipara, is by no means desirable.

If the occiput has rotated into the hollow of the sacrum, artificial rotation is, of course, out of the question. The head must be delivered with the occiput posterior (Figs. 212 and 213). For this a special technic is necessary, and this, too, will be found in the chapter on the forceps operation.

Transverse Presentations

Strictly speaking, a transverse position of the fœtus is one in which the long axis of the fœtus corresponds to the transverse axis of the uterus. With the full-term fœtus, however, this is hardly possible, and so it comes

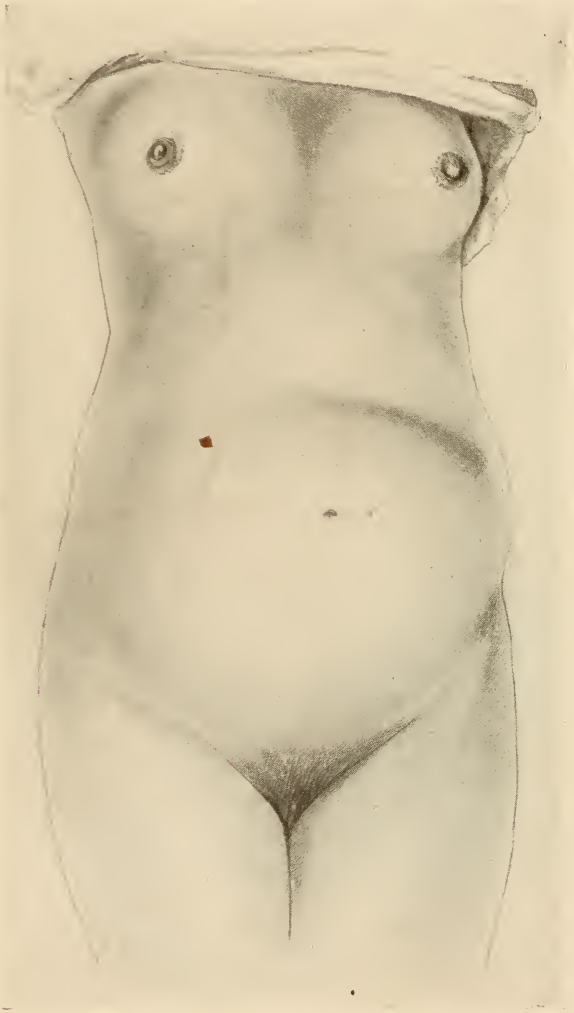


Fig. 214.—External appearance in transverse position.

about that in practice most so-called transverse presentations are in reality presentations of the shoulder, the long axis of the fœtus being oblique rather than transverse.

Etiology.—Anything that prevents the engagement of the head, *e.g.*,

contracted pelvis, unusual size of the head, tumor, or placenta prævia, may cause transverse presentation.

Again congenital deformity of the uterus (the cordiform or heart-shaped uterus) may make it impossible for the fœtus to assume the longitudinal position. In such cases successive labors are thus complicated.

Most common of all are those conditions which increase the mobility of the fœtus. Multiparity is a predisposing cause, since pregnancy increases the transverse diameter of the uterus. Hydramnion, twin-pregnancy, and small size of the fœtus act in the same way.

Diagnosis.—Inspection.—In many cases the practised eye notes that the uterine ovoid is transverse rather than longitudinal (Fig. 214). This

Fig. 215.—Palpation in longitudinal position.

can sometimes be made very apparent by placing a hand on either side of the abdominal tumor, as in Fig. 215. However, one cannot depend upon this method of diagnosis alone.

Auscultation.—The fetal heart-sounds are heard in the neighborhood of the umbilicus, usually somewhat below. They are most distinct upon the side toward which the head is directed. On the whole it is somewhat more difficult to locate the fetal heart-sounds than in vertex presentations.

Palpation.—Here, as in breech presentations, one feels for the head

in its usual position and fails to find it. The position then must be transverse, or perhaps the breech may present; but the fundus is not as high as usual and its characteristic outline is lacking. Further search will usually reveal the head in one iliac fossa and the other fetal pole diagonally opposite under the heart or liver. Or the positions of the fetal and cephalic poles may be reversed. With one hand at either pole external

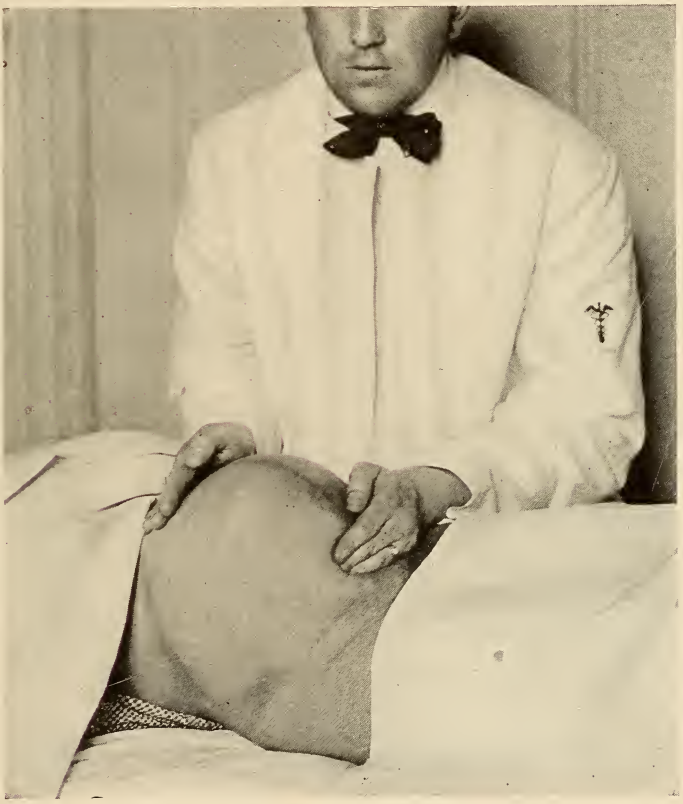


FIG. 216.—Palpation in transverse position.

ballottement may be practised. The fetal position is no longer in doubt (Fig. 218).

After labor is in progress, and especially after the membranes have ruptured, the diagnosis by external methods is less easy. The fœtus is doubled upon itself and neither palpation nor ballottement is satisfactory. But the shoulder has become crowded down into the inlet where it is accessible to internal examination and furnishes valuable information.

Of course, when we speak of the shoulder in this connection we do not mean simply the bony point or "tip" of the shoulder but we include as

well the structures immediately surrounding it. Viewed in this way the most typical thing about the shoulder is the adjacent portion of the chest wall, the *gril intercostal* of Pajot or the intercostal gridiron, as it has been called in English. Nothing else like this is encountered in the whole course of vaginal examination. The examining finger in the axilla feels the ribs and the depressions between them. Hence the name gridiron.

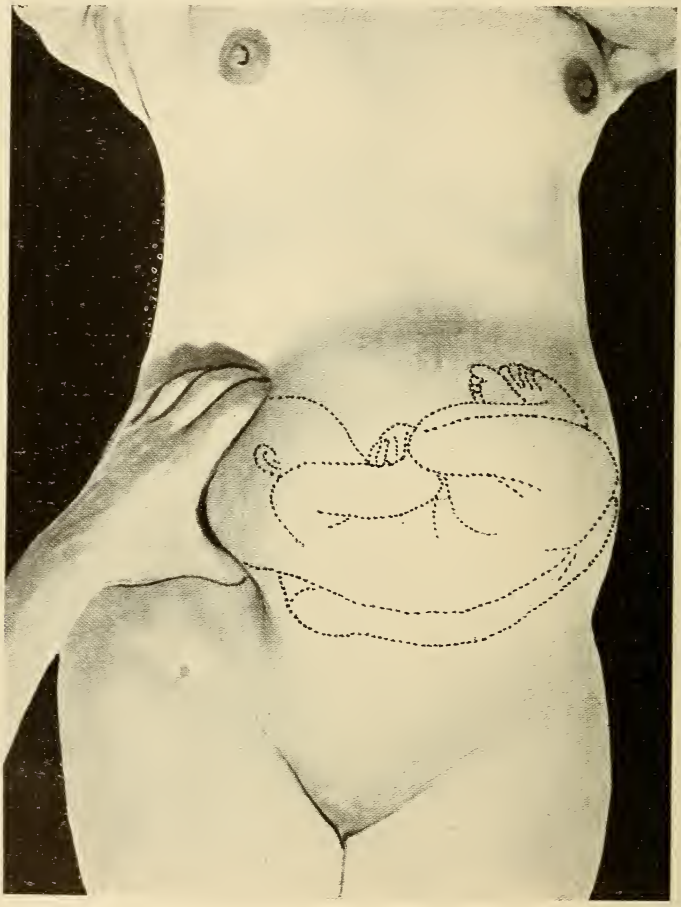


FIG. 217.—Shoulder presentation. Palpating hand grasps the head.

Having found this, it is easy to reconstruct in imagination the position of the fœtus. Of course the upper (closed) part of the axillary space points toward the head and the lower toward the feet, while the collar-bone, easily recognized, marks the anterior surface of the fœtus. If a prolapsed hand protrudes, as is often the case, and the accoucheur grasps it, he grasps the hand of the same name as his own.

Diagnosis is here of prime importance, because it is the only key to correct treatment, and nowhere in obstetrics does more depend on correct treatment than in the management of transverse positions.

Influence Upon Labor.—Owing to the fact that the shoulder, which is at best a poor dilator of the cervix, descends but slowly, the first stage is delayed. There is nothing to keep back the amniotic fluid and, as in

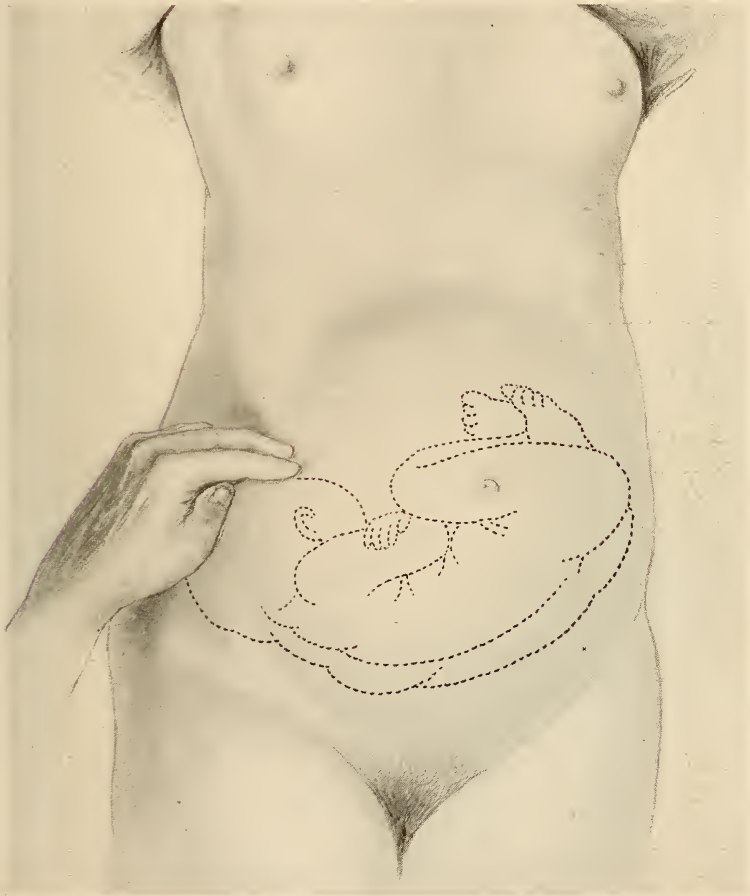


FIG. 218.—Ballottement in case of shoulder presentation.

pelvic contraction, the membranes protrude from the cervix in a long pouch. Premature rupture is common.

After a time the shoulder becomes impacted in the pelvic brim and progress ceases. The lower uterine segment becomes very much thinned and closely applied to the fœtus. The pain is severe and there is no complete relief, even between the contractions. There is marked tender-

ness over the lower uterine segment, and the other signs of impending rupture of the uterus are not long delayed.

Strictly speaking, there is no mechanism of delivery in these cases. Nature does not intend that the patient shall be delivered in this way. If the fœtus is of normal size, its delivery *per vias naturales* is practically impossible. Now and then, if the fœtus is small and flexible, it may find a way of escape in the so-called spontaneous evolution. Under the influence of the uterine contractions the fetal trunk is bent sharply upon itself, the shoulder is crowded behind the symphysis, where it becomes fixed, and the breech is forced past the shoulder and through the vulva. This phenomenon, which the student must study but which he will probably never witness, is shown in Figs. 219, 220, 221 and 222.

Treatment During Pregnancy.—Theoretically, the treatment for transverse position during pregnancy is external version. Unfortunately, the conditions which caused the original are likely to cause its recurrence. Nevertheless the procedure, if carefully performed, is harmless and for that reason is always worthy of trial. The subject is discussed, and the operation of external version is described and illustrated in the chapter on version.

Treatment During Labor.—Early in labor and before rupture of the membranes it may still be possible to bring the head by external manipulations from its position in one or the other iliac fossa to the pelvic brim. Much more often the task is accomplished by the contractions themselves and the necessity for operation disappears. I have known this to happen when the fœtus seemed firmly fixed in its abnormal position, prudent efforts at external version being unsuccessful.

If the transverse position is not or cannot be corrected great care should be taken to prevent premature rupture of the membranes. During this period the physician should not be long absent from his patient since the membranes might rupture and subsequent version be difficult or perhaps impossible.

If the membranes have already ruptured treatment should be instituted without delay. Here there is no sense in waiting on nature and conservatism can only end in disaster. The treatment consists in bringing down a foot by the operation of version. When this has been done the danger to the mother is practically over. Early in labor, before much liquor amnii has drained away, the operation is easy. Later it may be difficult or impossible.

Version in these cases presents certain special features which merit careful attention. In the first place, there has been little or no dilatation of the cervix and consequently manual dilatation should be performed with care before delivery is undertaken. In this way subsequent difficulty in extraction is best avoided. In the second place, since the hand of the operator is seeking a fetal foot the left hand should be used when the feet are on the mother's left side, and *vice versa*.

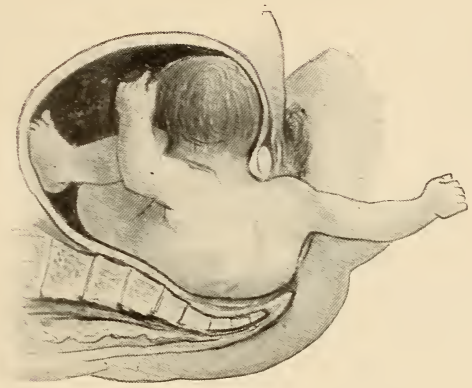


FIG. 219.—Spontaneous evolution, first stage.

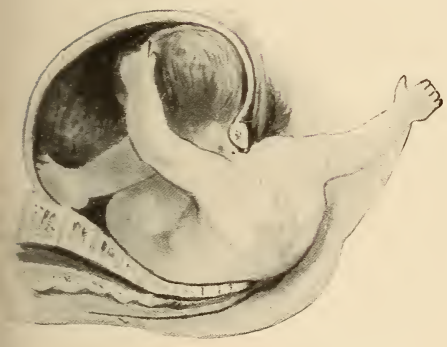


FIG. 220.—Spontaneous evolution, second stage.

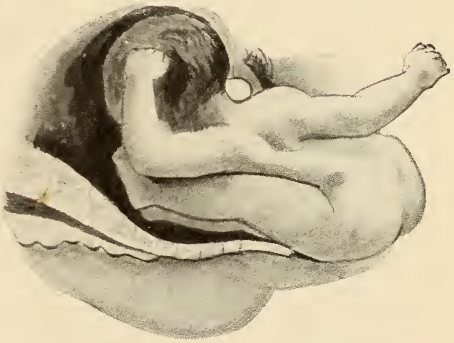


FIG. 221.—Spontaneous evolution, third stage.

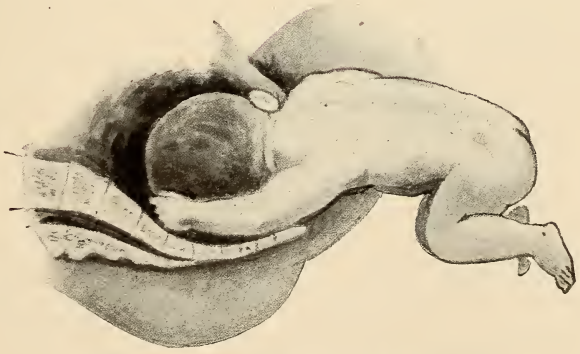


FIG. 222.—Spontaneous evolution, fourth stage.

In the third place, anterior rotation of the back is favored by bringing down the lower foot in dorso-anterior positions, and in the less common dorso-posterior positions the upper foot.

All this, which is rather difficult to explain in print, will be made clear

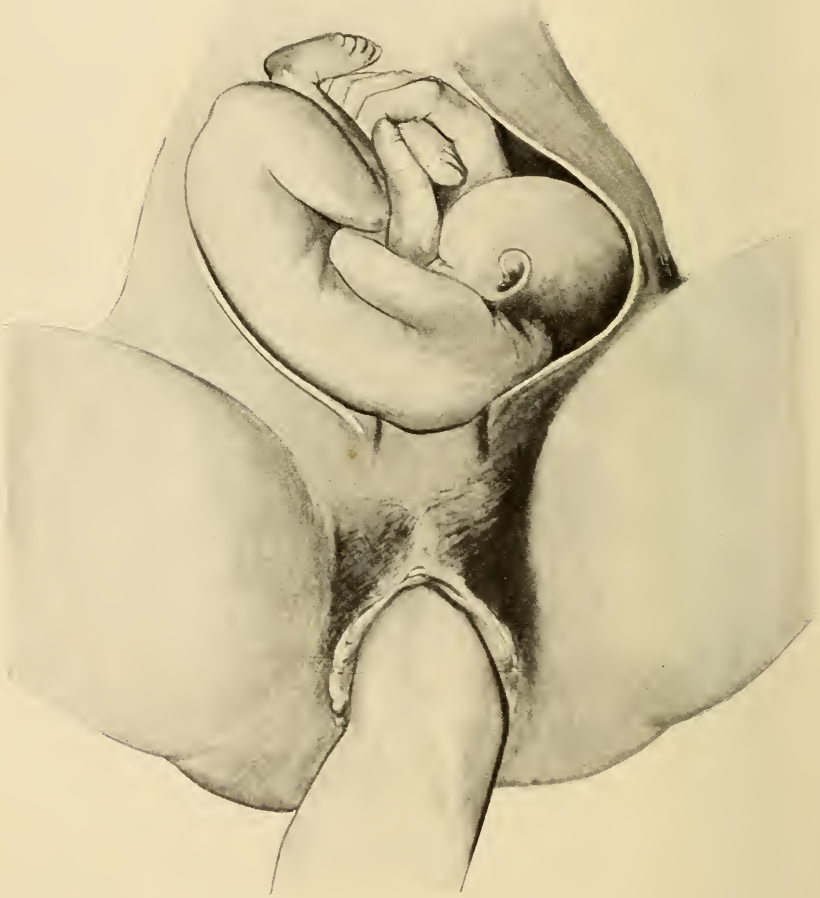


Fig. 223.—Version for transverse position. Back anterior.

by the accompanying illustrations (Figs. 223, 224, 225 and 226). For example, it is not necessary to explain to the reader why in Fig. 224 the operator is using his left hand in preference to his right.

These rules, however, are to be used as guiding principles rather than

arbitrary dicta. They are aids rather than objects in themselves. As Bumm has wittily said, there are few obstetricians who, having finally succeeded in reaching and grasping a foot, will release it because theoreti-

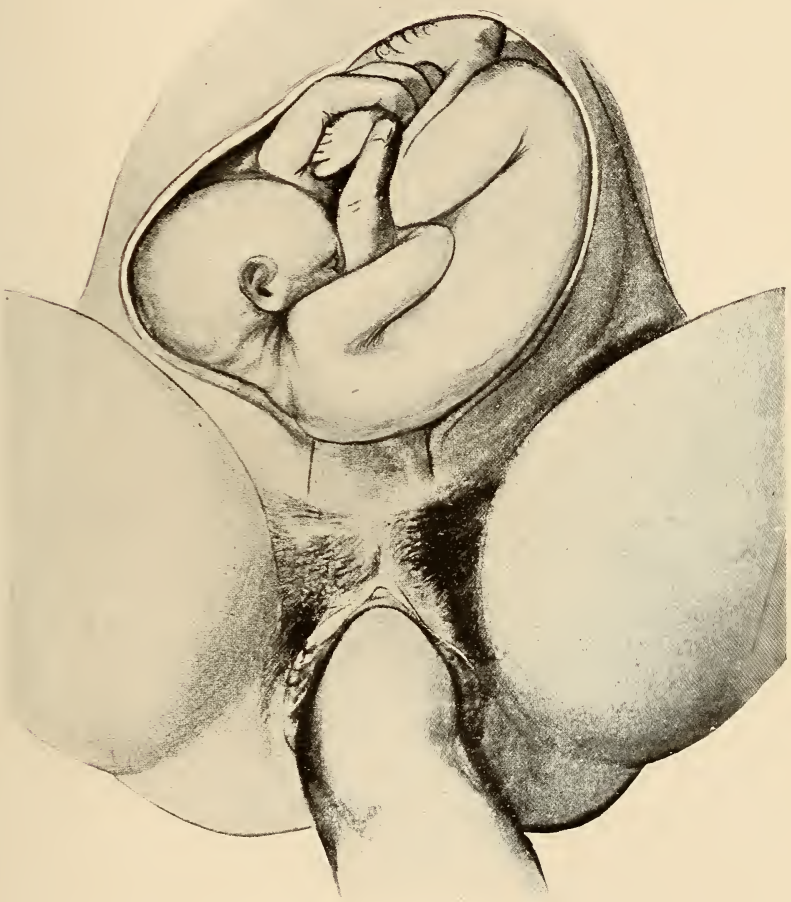


FIG. 224.—Version for transverse position. Back anterior.

cally it is not the right one, and pursue the search for another. Time is too precious for this.

In neglected cases, when the fluid has drained away and the lower uterine segment has become tightly applied to the fœtus, great care must be used. The operator must know how to utilize every possible advantage. The patient should be conveniently placed upon a firm table. Profound

narcosis is sometimes necessary and the lateral position is of great advantage. It is sometimes possible to bring down a foot with the patient in the lateral position when this cannot be done with the patient upon her back. I can speak upon this point from experience. Seldom seen in print, it is yet one of the most important facts in clinical obstetrics.

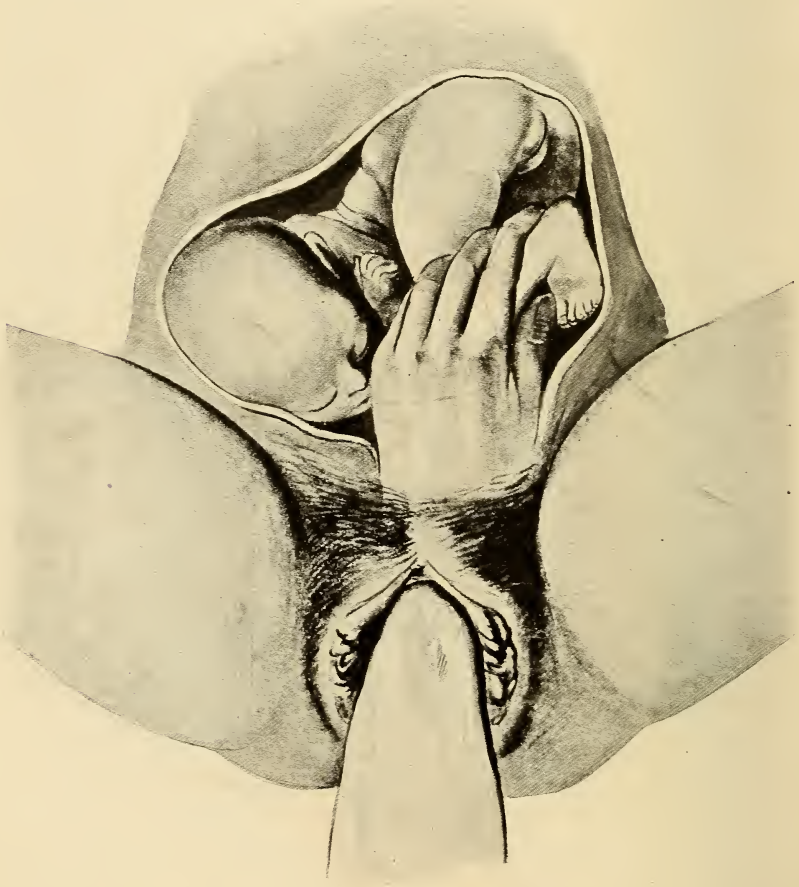


FIG. 225.—Version for transverse position. Back posterior.

Prolapse of a hand and arm is a frequent complication. The hand should be secured by a fillet and held to one side until version has been performed. The inexperienced accoucheur often has the idea, not unnatural, that the arm should be replaced, but this would only make the subsequent extraction of the after-coming head more difficult.

Breech Presentation

In breech presentation, or pelvic presentation, as it is more commonly called, the pelvic end of the fœtus presents. Usually the nates are first felt by the examining finger and the feet are within easy reach. This is called a full breech. More rarely the legs are extended upon the fetal body as upon a splint and the feet are in the region of the face. This is

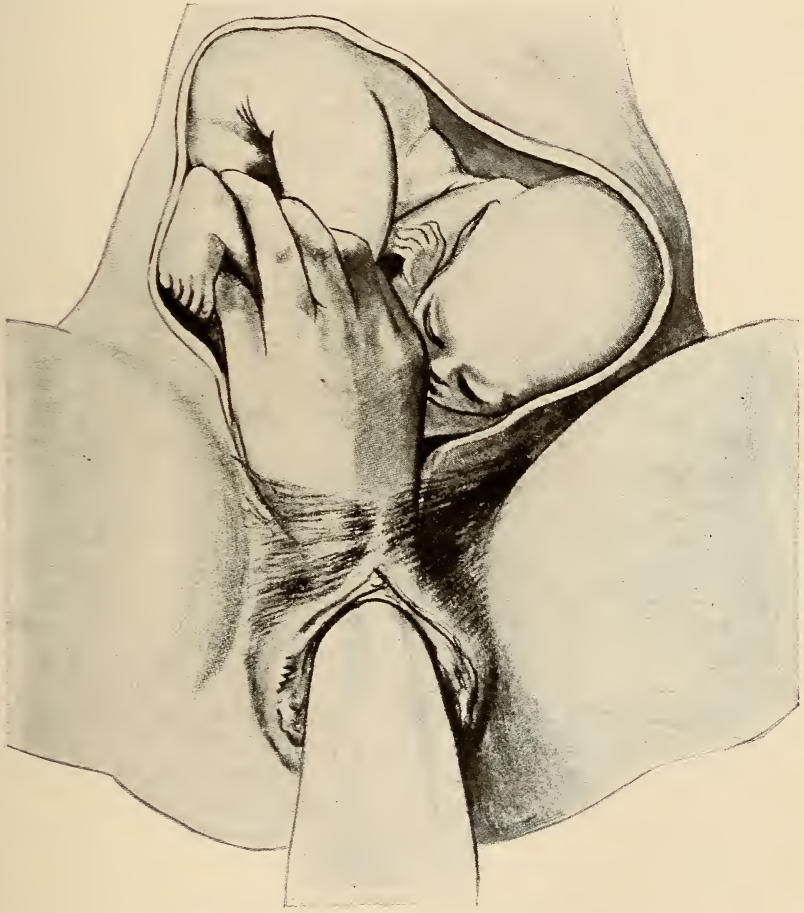


Fig. 226.—Version for transverse position. Back posterior.

a breech presentation with extended legs or, as it is sometimes called, a "frank" breech and is of clinical importance, as we shall presently see, since it may give rise to great difficulty in delivery. Foot, or, to use the quaint vocabulary of the older writers, "footling," are simply complications of breech presentation. This is also true of the much more rare knee presentation.

Frequency.—It is said to occur in about 3 per cent. of all cases.

Etiology.—Breech presentation is usually the result of lack of accommodation between the head and the pelvic brim, *e.g.*, pelvic contraction, or unusual size of the fetal head, which is relatively the same thing. It may be caused by anything which obstructs the entrance to the pelvic brim, tumor, placenta prævia, the head of a twin, etc. When the fœtus has much freedom of movement in the uterine cavity breech presentations are more common. Hence they are oftener found in the lax uterus of a multipara, when the fœtus is macerated, premature, or very small, and when there is an excess of amniotic fluid. Uterine obliquity may be a cause (Fig. 227).

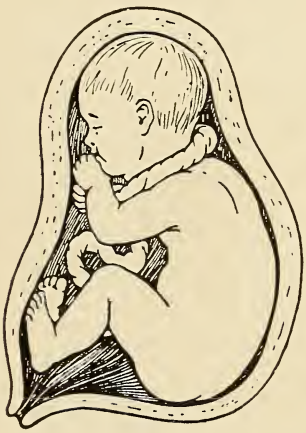


FIG. 227.—Diagram showing how obliquity of the uterus produces footling presentation. (After Küstner.) (Herman's Difficult Labor, Wm. Wood & Co.)

Mechanism.—There is usually no great difficulty in the passage of the breech through the pelvic brim, though it is always found above the brim at the beginning of labor. Even in primiparæ it does not descend into the cavity of the pelvis during the latter weeks of pregnancy.

As in normal labor the occiput is the index of presentation, so in breech presentation is the sacrum—at least nominally. In practice the anterior hip corresponds to the occiput, and it is this that we have to consider if we would make the process intelligible.

Owing to the comparatively small size of the breech there is usually no opposition at the brim of the pelvis, and the breech descends to the pelvic floor without the necessity of any special mechanism. Progress is usually slow during the first stage, owing to the fact that the breech is a poor dilator of the cervix.

Just as the occiput strikes the pelvic floor first in normal labor and is deflected to the median line, so in breech presentation does the anterior hip, which is normally somewhat in advance of the posterior, rotate under the pubic arch, bringing the bitrochanteric diameter, the longest diameter of the breech, into coincidence with the anteroposterior diameter of the outlet, where there is the most room.

Thus the anterior hip again takes the place of the occiput at the subpubic arch. If now the breech were driven downward and forward in a straight line it would of necessity plough its way through the perineum, but, as in head presentations, the bending of the neck permits the extension of the head, and its consequent expulsion, so the flexible trunk of the child allows the posterior hip to be expelled by a similar mechanism.

After the birth of the hips the body, if of normal size, follows without trouble, the shoulders rotating until the bisacromial diameter becomes anteroposterior at the outlet (Fig. 228).

If everything proceeds normally the arms remain folded across the chest and the head well flexed. After the shoulders are delivered they undergo a movement of external rotation, making the bisacromial diameter again transverse, while the head rotates internally until the back of neck comes to lie under the subpubic arch. Face and forehead then sweep over perineum, chin, mouth, etc., appearing in order until expulsion is complete.

Unfortunately, unless the child is very small, the normal mechanism of expulsion in these cases is the exception rather than the rule. Either premature traction has been made, causing extension of the head and

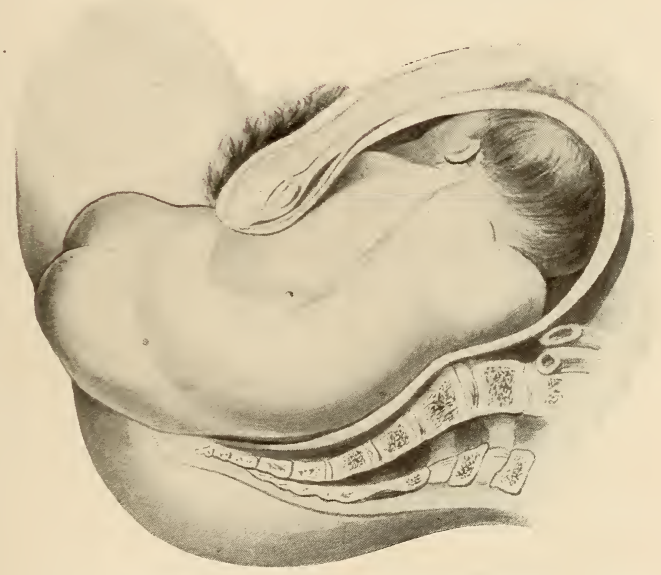


FIG. 228.—Lateral flexion of fetal body in breech presentation. (Hodge.)

arms, or after the birth of the hips delivery is so long delayed that in spite of pressure upon the head through the fundus extraction becomes necessary with the same result.

In some cases the fetal back and occiput rotate posteriorly with the result that the chin instead of the occiput rotates under the pubic arch. In this case the face sweeps under the subpubic arch instead of over the perineum. This posterior rotation should not occur if the operator is on his guard. It is to be prevented by guiding the back forward during the expulsion of the breech. It is always an evidence of clumsiness or carelessness on the part of the operator.

Diagnosis.—The competent examiner should be able to make the diagnosis by external examination. The first thing that he will notice is the absence of the head from its usual position. This is the key to the

diagnosis. The absence of the head from its usual position can be more easily determined than its presence at the fundus, where it is somewhat more difficult to palpate. Having determined this absence, and having excluded a transverse presentation by the rules already given, we can proceed to find the head at our leisure.

Palpation.—As in vertex presentations, the back may be felt on one

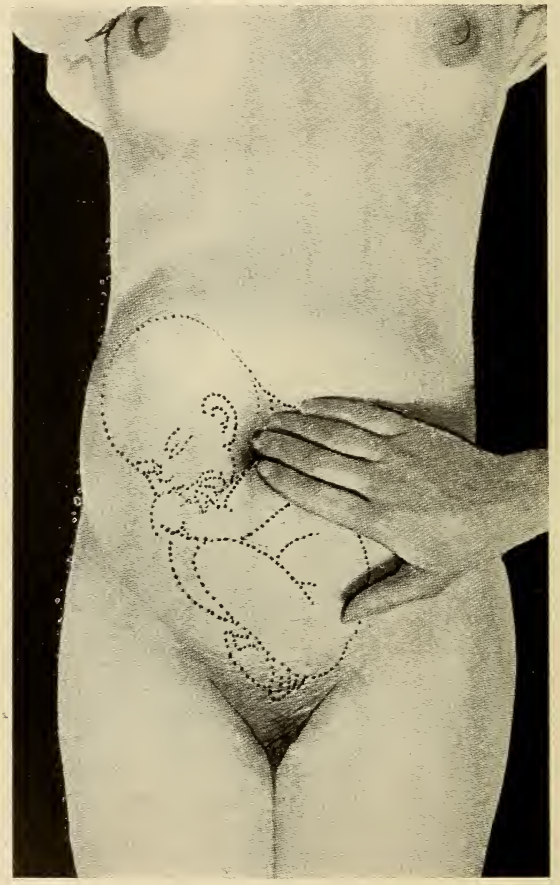


FIG. 229.—Palpation of the shoulder in breech presentation.

side and the small parts on the other. The shoulder also may be palpated, but the fœtus as a whole is more movable than in vertex presentations and the findings less satisfactory. The head, however, can always be made out unless the abdominal wall is very thick. Ballottement may also be obtained (Figs. 229, 230 and 231).

One often reads that in breech presentation the fetal heart-sounds are necessarily heard above the umbilicus. This is not the case nor is

there any particular reason why it should be. The statement is likely to lead to grave errors in diagnosis. In these cases the fetal heart-sounds are often best heard at or below the level of the umbilicus.

Internal Examination.—If the membranes have been ruptured and the breech is well down in the pelvic cavity the diagnosis is easy. The sacrum and anus and, in the male, the scrotum should be recognized

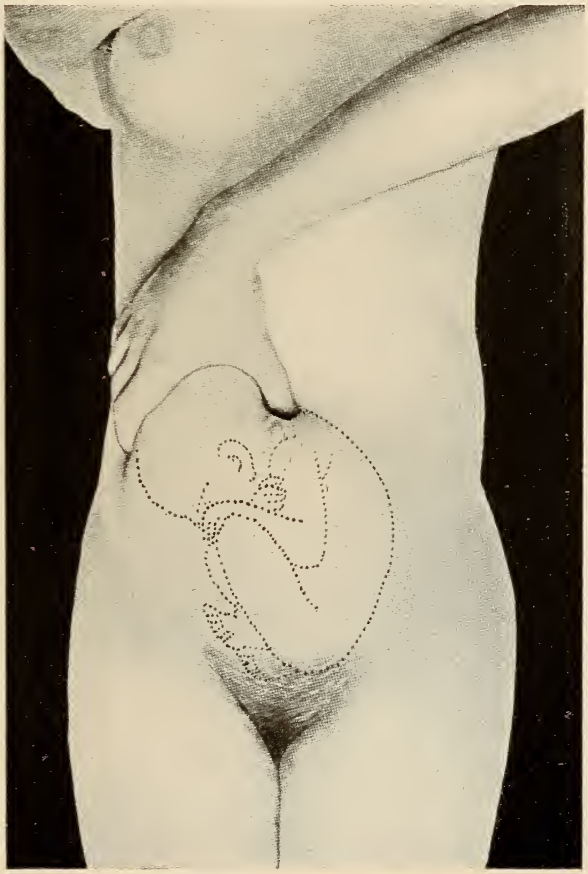


FIG. 230.—Palpation of the head in breech presentation.

without difficulty. The finger may be smeared with meconium. On the whole, however, such descriptions serve to confuse, rather than to enlighten. To tell the reader that there are no eyes in the breech, that the finger in the anus does not feel the jaws, etc., borders upon the ludicrous.

There are cases in which the diagnosis by digital examination is not immediately possible. These are the cases in which the presenting part

is far above the brim of the pelvis and can barely be reached by the examining finger. If the examiner relies solely upon the evidence afforded by digital examination he may be for a time in doubt. He feels certain that he is not dealing with a vertex presentation. It may, however, be one of the face or possibly of the shoulder. The introduction of the hand would settle the question but in the absence of a distinct indication this

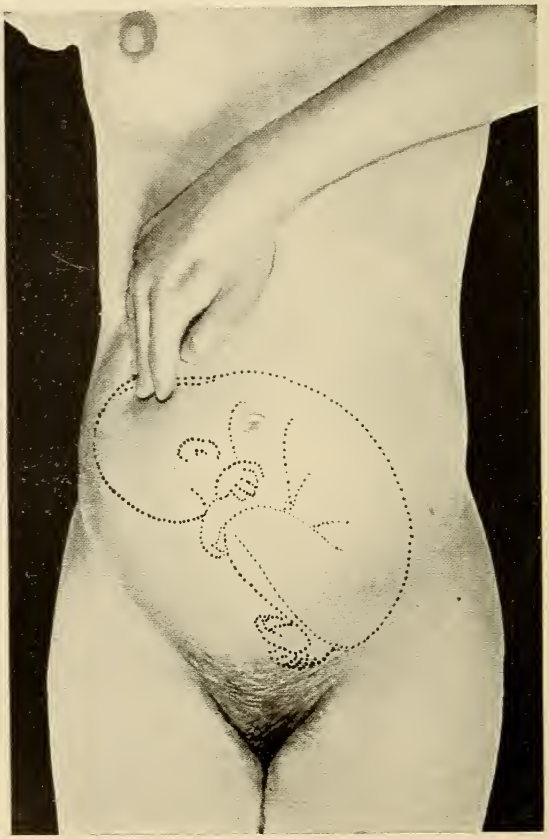


FIG. 231.—Ballottement in case of breech presentation.

is hardly justifiable. External palpation, however, reveals the head, which in a case like this is above the brim and easily palpable and excludes the possibility of breech presentation.

Prognosis.—There should be no special maternal mortality in cases of breech presentation carefully and aseptically conducted, but owing to the necessity for rapid delivery of the after-coming head there is considerably more risk of perineal laceration, sometimes unavoidably severe. The fetal mortality, however, is considerably higher than in normal labor.

It is usually estimated as one in ten, but no accurate estimate is possible since the matter depends almost altogether upon the skill and experience of the attendant. It is safe to say that it is greater in primiparæ, owing to the greater difficulty in the delivery of the head.

Effect Upon Labor.—The first stage is long and tedious; in some cases intolerably so. This is due to the fact that the breech is a poor dilator of the cervix. The amniotic fluid escapes beside the small irregular breech and distends the protruding sac and, as in transverse positions, early rupture is common. This tends still further to delay the progress of labor.

Early rupture of the membranes and a long and wearisome first stage, then, are frequent accompaniments of breech presentation. The second stage, however, is usually much shorter. The breech finds no great obstacle to its passage in the pelvic cavity or at the vulva, and the after-coming head must be delivered quickly.

Treatment.—Great patience and tact are called for in the management of the first stage. Since the early rupture of the membranes is a distinct disadvantage it is wise for the patient to lie down during the first stage. This is contrary to the usual rule but the advantages of the recumbent position here outweigh the disadvantages.

The attendant must have the resolution to resist the importunities of the patient and her friends. All interference within the passages and especially all efforts to hasten delivery by traction are to be avoided. Such efforts tend to reverse the normal mechanism, cause extension of the head and arms, and thus delay the delivery of the after-coming head and perhaps cause the death of the child. As long as progress is being made and the mother's condition is satisfactory an expedient policy is indicated. Meanwhile something may be done by the use of chloral or by the cautious use of morphine, or of morphine and hyoscine, hypodermatically, to alleviate the patient's sufferings during the long hours that nature occupies in the process of cervical dilatation.

As soon as the second stage approaches the patient should be placed in the cross-bed position, or, still better, upon a table with her hips drawn well over the edge. Under no circumstances should delivery be attempted with the patient lengthwise in bed. This is deliberate trifling with fetal life.

Profound narcosis is undesirable since the voluntary efforts of the patient aid materially in the delivery of the breech, and traction is, for the reasons stated above, to be avoided. Pressure upon the fundus, however, aids materially and has no disadvantages. If the suffering is acute, or the patient over-sensitive, she may be induced to " bear down " by the administration of a few drops of ether with each contraction. The posterior hip should be guided in such a way as not to plough through the perineum.

When the breech appears at the vulva, however, there must be a complete reversal of policy. At this time pressure upon the cord and

corresponding danger to the fœtus begin. The danger is much greater in primiparæ. The problem at this time is rapid delivery. He who would succeed in the management of breech presentation must know how to deliver the after-coming head.

The proper technic of the delivery of the after-coming head should be followed out in every detail. The matter is fully considered in connection with the operation of version, of which it is an essential part.

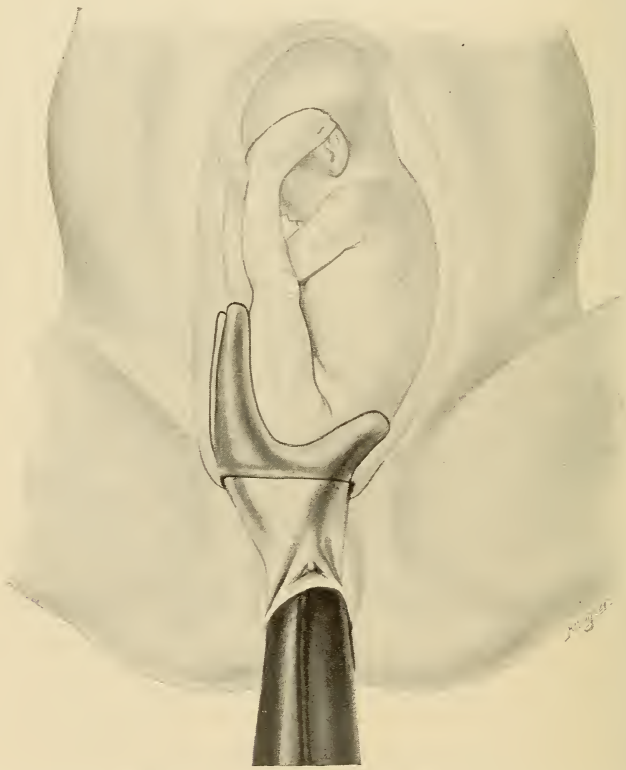


FIG. 232.—Breech presentation with legs extended. Ready to flex the knee, first step.

Of course, the expectant treatment of the first stage is not always practicable, though it should be followed whenever the interests of the mother permit. In breech presentation, as in that of the vertex, arrest of progress may occur and artificial aid may be demanded. This is best rendered by bringing down a foot. Sometimes the foot is within easy reach and the matter is perfectly simple. In other cases the legs are extended along the body of the child and the feet almost as high as the head, as in Fig. 232. In this case a foot can usually be reached by the method of Pinard. The patient is anæsthetized and prepared as for

version. The choice of hand is also the same as for version; *i.e.,* the hand whose palmar surface when held half-way between pronation and supination will correspond to the abdominal surface of the child. This is introduced as in version and insinuated very slowly and gently, its palmar surface toward the belly of the child and its dorsal surface toward the uterine wall until the tips of the fingers reach the flexure of the knee. At this point pressure is made, so as to flex the knee and bend it a little

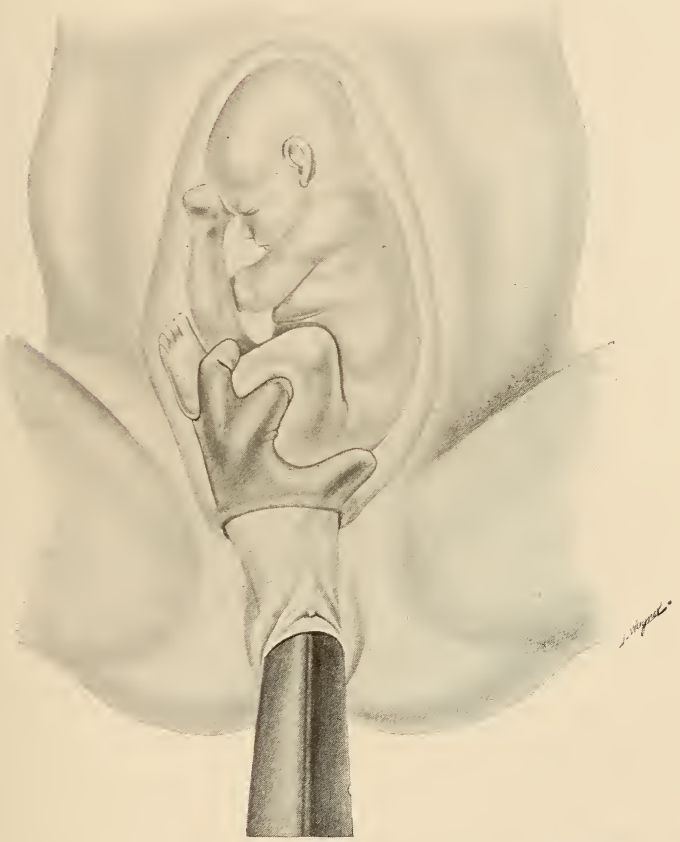


FIG. 233.—Breech presentation with legs extended. Bringing down a foot, second step.

outward. This usually suffices to bring the foot within reach of the finger. The operator should recall that it is the anterior foot which he is seeking. The reasons for this are given in the chapter on version (Fig. 233).

In some cases there may be no room for the passage of the hand, and even the introduction of the finger into the groin is impossible or ineffectual. In this dilemma we are reduced to the necessity of a choice

between several rather unsatisfactory methods: the forceps, the fillet, and the blunt hook. The forceps is not an ideal instrument for application to the breech, but it is in my opinion more effectual and less dangerous to the fœtus than either of the other two instruments. Its use in this emergency has been discussed in the chapter on the forceps operation. Continuous moderate traction, with firm pressure on the fundus by an assistant, often suffices to bring the breech within reach of the finger when the latter can be hooked into the groin and delivery thus completed. Of course, no attempt is made to complete the entire delivery with the forceps.

The delivery of an impacted breech is one of the most difficult tasks which the accoucheur is called upon to perform. For this reason it is the

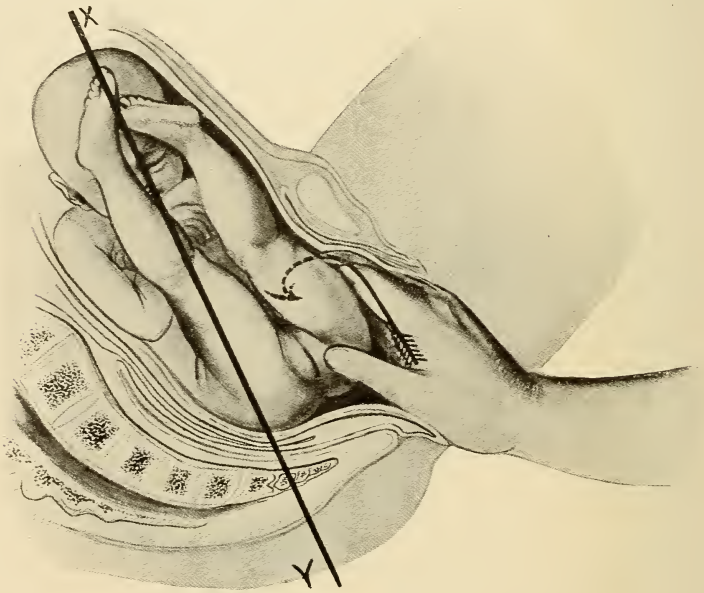


FIG. 234.—Releasing the anterior hip.

practice with some to bring down a foot early in labor, while the task is yet easy, thus providing a " handle " to be used in subsequent emergencies. The adoption of this measure as a routine practice would undoubtedly do much more harm than good. It should be reserved for those cases in which there is reason to believe that there is marked disproportion in size between the fœtus and the maternal parts, *e.g.,* in the case of a patient who has gone over her time and who has a history of difficult labors and large children.

In easy cases, or when the breech is well down in the pelvis, the finger in the groin answers every purpose. It should first be hooked into the anterior groin and traction made downward and as far backward as possible until the posterior hip begins to distend the perineum. Traction

may be aided by grasping the wrist. The finger is then changed to the posterior groin and traction made directly upward. The use of both hands making traction in both groins, so often figured in the text-books, I have not found necessary and believe that it imposes an unnecessary strain upon the perineum. Pressure upon the fundus aids very materially (Fig. 234).

The danger of asphyxia after breech deliveries is considerable and the attendant should on no account neglect to have in readiness such assistance and appliances as are necessary for its proper treatment.

Unlike most of the malpresentations those of the breech are relatively common. The danger to the fœtus is so great that it behooves the practitioner to make a careful study of the subject. For this reason I venture to sum up what seem to me the most important points.

The first stage should be treated expectantly. Every effort should be made to avoid rupture of the membranes. Attempts to hasten delivery by traction should be studiously avoided.

As soon as the breech appears at the vulva, delivery should be hastened as much as possible.

The operator should know how to deliver the extended arms and the after-coming head in time to save the child. This is by far the most important part of the treatment. Many men are deficient in this respect. Many men who can do good emergency work in surgery, who, for example, could treat promptly and successfully an appendicular abscess or a strangulated hernia, are unable to perform this every-day procedure upon which the life of the child and the happiness of the mother depend. He who would undertake the responsibility of these cases should learn the technic in advance.

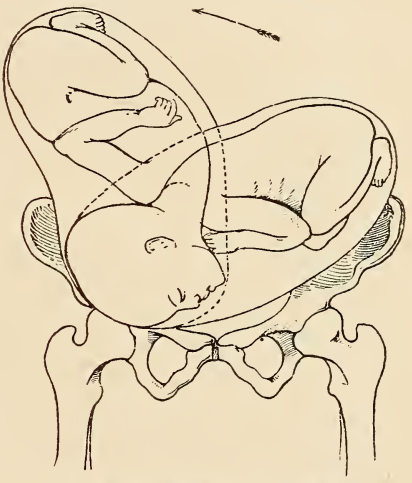


Fig. 235.—Face presentation due to latero-version of the uterus. (Ahlfeld.)

Face Presentation

This is a rather rare anomaly occurring, according to Pinard, once in 250 cases.

Etiology.—Face presentation is an example of extreme extension and the causes are those of extension in general, already mentioned. Marked latero-version has been adduced as a special cause. This is more easily illustrated than described and is well shown in Fig. 235. Certain fetal anomalies may act as causes. The dolichocephalic head obviously has a tendency to cause extreme extension, and a hemicephalic would naturally

result in a presentation of the face, though in the latter case it would have no special clinical significance. Examples of marked extension caused by direct mechanical interposition are sometimes found in tumors of the throat, or in the presence of a prolapsed hand or arm under the chin.

Mechanism.—The head may come down in a condition of extreme extension, the face entering the brim directly, but more commonly the brow is first caught at the brim, the face being brought down as the result of further extension. Descent goes on caused by the same factors that obtain in normal labor, but rotation occurs much earlier; probably because the presenting diameter is much longer. Unfortunately the chin is usually posterior at the brim and it is in these cases that the "long rotation,"

FIG. 236.

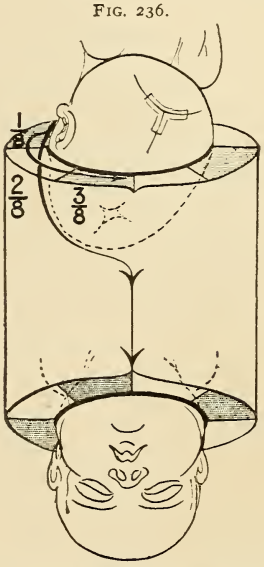


FIG. 237.

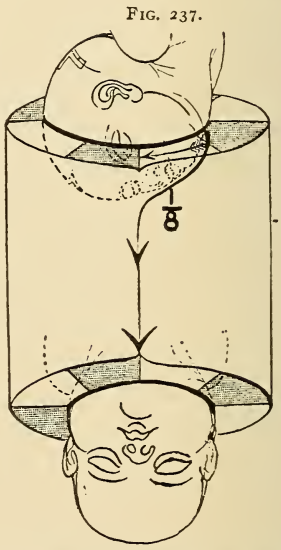


FIG. 236.—Anterior rotation of chin in R. M. P. position. Three-eighths of a circle.
FIG. 237.—Anterior rotation of chin in L. M. A. position. One-eighth of a circle.

three-eighths of a circle, is necessary (Figs. 236 and 237). It is this long rotation that makes most of the trouble in face presentations. Here again we have an example of the practical value of a knowledge of the mechanism of labor. Not only is the cause of delay made plain but if the attendant finds the chin posterior early in labor he is reassured by a knowledge of the fact that the posterior position occurs as a passing phenomenon in the great majority of cases.

After the chin has rotated to the front the region beneath the chin, the *sous menton* as the French call it, becomes fixed under the pubis and the head is born by a movement of flexion, mouth, nose, eyes, forehead, vertex and occiput successively making their appearance at the vulva.

Diagnosis.—One who is a master in external diagnosis will sometimes

be able to make a diagnosis without internal examination. The condition is usually overlooked, however, because it is so rare that one does not think about it.

Let us take the most common of the face positions, the right mento-posterior. The back, as in all right posterior positions, is far away from the median line and, owing to the backward projection of the occiput, is palpable to a less extent than usual. The latter is notably prominent and makes a sharp angle with the back, the dorso-occipital angle of face presentation, as I have ventured to call it. Between the occiput and the back is a deep depression corresponding to the back of the neck.

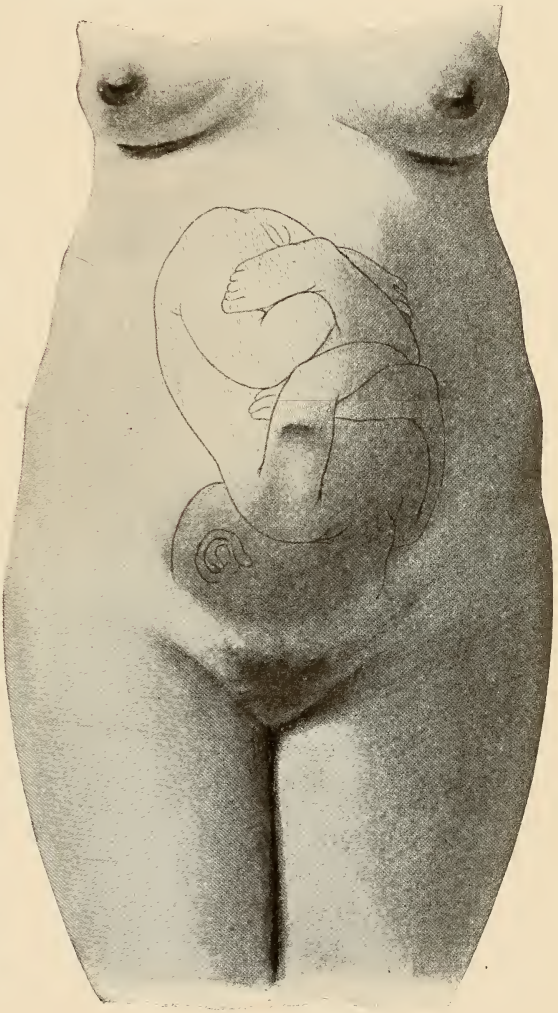


Fig. 238.—Face presentation.

Anteriorly and to the left are felt the small parts. Owing to the forward protrusion of the chest, the fetal heart sounds with more than ordinary distinctness. Before the beginning of labor, and as long as the head remains above the brim, they are usually heard not far from the median line, in the neighborhood of the umbilicus.

Internal Examination.—The face, if accessible, can be confounded only with the breech. Its distinguishing features are the orbits and the nose. It is said that the anus has more than once been mistaken for the mouth and even for the undilated cervix. *If the face is high and difficult to reach, or if it is much swollen* the diagnosis by internal examination may present considerable difficulty. If the attendant is in doubt, however, external palpation will settle the question. Should the presenta-

tion be one of the breech or shoulder the head cannot be found at the brim or in the cavity of the pelvis. Here we have another instance of the value of external examination (Figs. 238, 239 and 240).

Treatment.—First of all a careful measurement of the pelvis is in order. Pelvic contraction and face presentation often go together, the latter being the result of the former. In such cases it is the pelvic contraction, not the face presentation, that is the primary object of treatment.

If the child is of great size the conditions are relatively the same, and the treatment should be the same, but unfortunately our methods of determining the size of the fetal head are still unsatisfactory.

Every care should be taken to prevent premature rupture of the membranes and physician and patient should try to make the best of the long

Fig. 239.—Mechanism in face presentation, chin anterior.

first stage that is characteristic of these cases. The sufferings of the patient should be lightened by the judicious administration of chloral or some other anodyne.

Interference is not indicated simply because the face presents, but only as the interests of mother or child demand, and the attendant should remember that forward rotation of the chin, like that of the occiput, often occurs at the last moment and contrary to all expectation. Vaginal examinations should be made very carefully in order to avoid injuring the eyes

of the child or causing excoriations of the swollen face. The physician should remember that in face presentation a face tumor takes the place of the scalp tumor, giving the child a most unprepossessing appearance. Of this it is well to advise the parents in advance.

If interference is demanded and the head is still above the brim the best treatment is version. Intra-uterine manipulations intended to convert the position into one of the occiput are not likely to succeed and are in themselves not altogether free from danger. In the second stage cautious efforts to produce anterior rotation of the chin by pushing up the forehead or by hooking the chin forward with two fingers may be tried,

FIG. 240.—Face presentation. Chin has rotated posteriorly. Arrest of labor.

but too much time should not be spent in this way. It is said that anterior rotation is favored by having the patient lie upon the side toward which the chin is directed and while the efficacy of this procedure is probably not very great it has at least the merit of doing no harm.

When the head is arrested well down in the cavity of the pelvis with the chin anterior, the forceps should be applied, *lege artis*. The technic of their use in face presentation is given in the chapter on the forceps operation, which the reader is advised to look over with care.

If the fœtus is of normal size its delivery with the chin posterior is mechanically impossible. In such cases a cautious attempt at rotation with

forceps or hand, preferably the latter, may be made. If it does not succeed and conditions are not favorable to the performance of pubiotomy or the Cæsarean section, perforation may be the only alternative (Fig. 241).

Brow Presentation

This is a rare complication of labor. Its frequency has been estimated as about one in three thousand. I knew one teacher of obstetrics who refused to admit its existence because he had never seen a case.

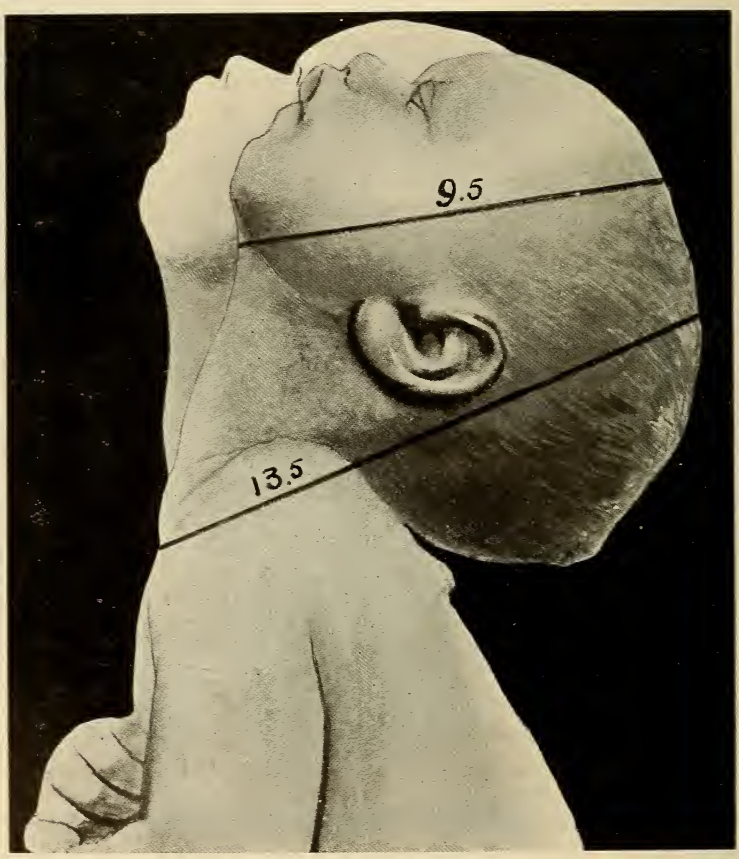


Fig. 241.—Face presentation, the head markedly extended. 9.5 centimetres, submento-bregmatic diameter; 13.5 centimetres, presterno-sincipital diameter.

Doubtless presentation of the brow occurs as a passing phenomenon in the majority of face cases, since it is evidently the result of an arrest of the process of extension. But we are speaking here of persistent presentations of the brow. Of these I can recall meeting with but two.

The presenting part is the brow, *i.e.*, the region bounded by the root of the nose and the region of the large fontanelle. The diameter which

engages in the pelvic brim is the occipito-mental, measuring 13.5 cm., the greatest diameter of the fetal head. This fact explains at once the formidable nature of this complication (Fig. 242).

Etiology and Mechanism.—Owing to the rarity of this complication opportunities of studying its etiology and observing its mechanism have been comparatively few. It is fair to assume, however, that the causes are practically the same as those of face presentation, *i.e.*, that they are the general causes of extension of the head. Bumm suggests that unusual

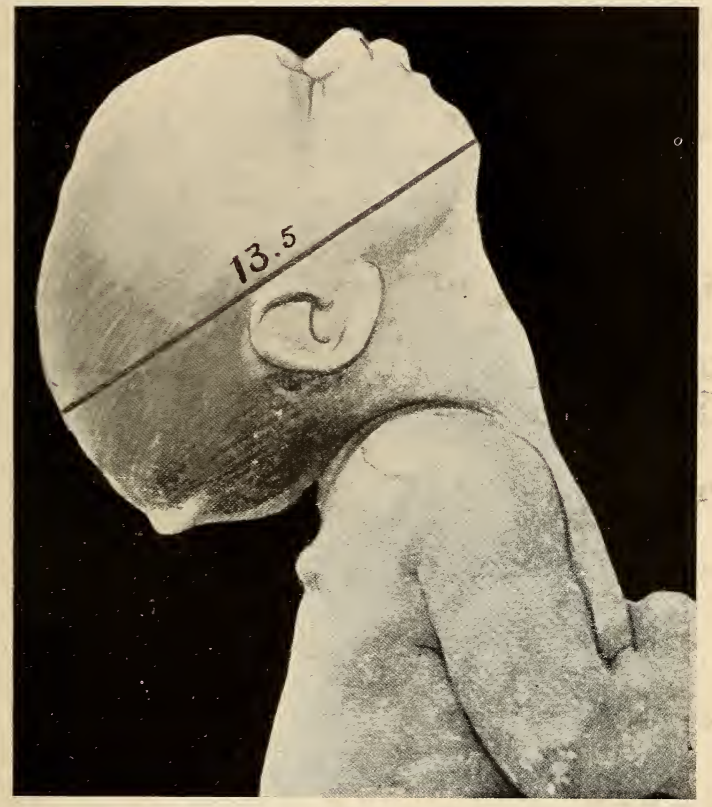


FIG. 242.—Brow presentation, the head moderately extended. 13.5 centimetres, sincipito-mental diameter.

size of the head may make full extension difficult or impossible and this accords with my own observation.

Mechanism.—In some cases, in fact in many cases, it is impossible for the long diameter to become engaged in the pelvic brim and natural delivery cannot occur. If contractions are good, however, and the disproportion not too great, the occiput is driven forward between the two parietals while the chin is also pushed back and the maxillary condyles as well. In this way a reduction of 1.5 cm. is brought about.

Of course the process is slow and difficult, and this is true of the descent and rotation that follow, and by means of which the root of the nose is finally brought beneath the symphysis. Mouth and chin follow. Under the influence of the uterine contractions the head becomes markedly

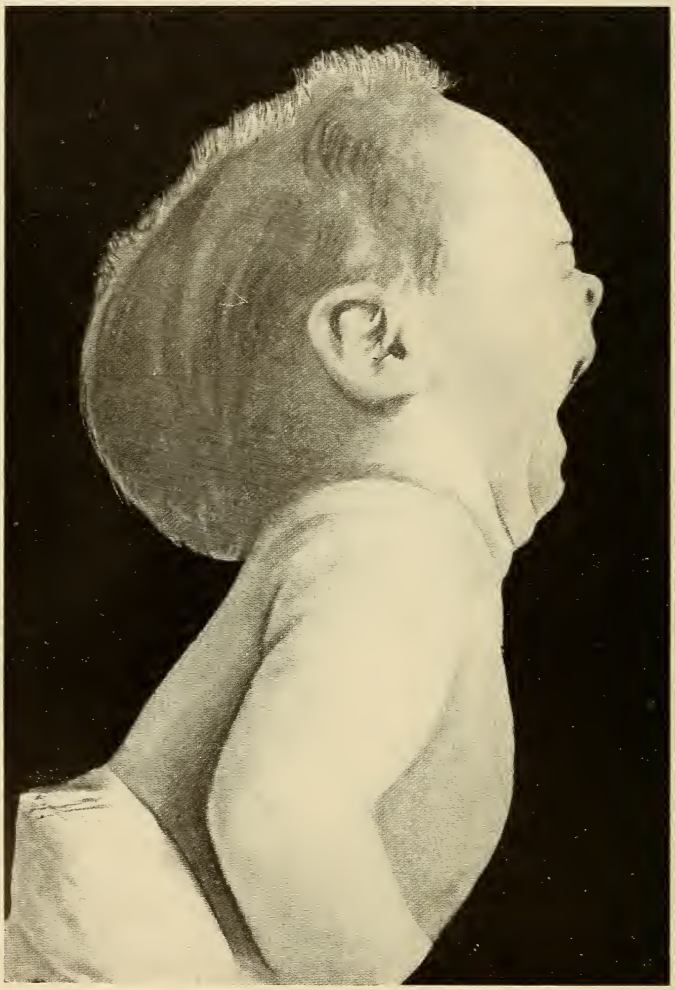


FIG. 243.—Deformation of the head in brow presentation.

flexed, a superior maxillary bone becomes fixed at the subpubic arch, as does the suboccipital region in normal labor, and brow, vertex and occiput are swept over the perineum as the result of the flexion. As soon as this has occurred the head naturally drops back and as extension occurs nose, mouth and chin pass under the pubic arch.

Configuration of the Head.—Fig. 243 (Fabre) well shows the peculiar configuration of the head in these cases. The mouth is open and both chin and occiput, opposite poles of the diameter of engagement, show the pressure to which they have been subjected in passing the brim of the pelvis. The forehead is swollen and the top of the head has a dome-like, somewhat pointed, appearance. The distance from the ear to the top of the head is much greater than normal.

Diagnosis and Clinical History.—External examination does not give the same accurate information as in presentation of the face. The dorso-occipital angle is present, but is hardly prominent enough to warrant a positive diagnosis.

Internal examination gives positive results. The large, soft anterior fontanelle near the middle of the field is the first thing to attract attention. This, however, is often within easy reach in posterior positions of the occiput. Certainty is attained by the fact that on further examination one can feel the orbits and root of the nose. The fact that the chin cannot be reached shows extension is not sufficient to constitute a face presentation.

Prognosis.—Reliable statistics are not at hand but there is no doubt that the prognosis for both mother and child is considerably less favorable than in normal labor, since difficult operative delivery is often necessary. Moreover, the rarity of the condition makes it liable to be overlooked.

Treatment.—For delay in the first stage the best treatment is version. Extraction of the after-coming head may prove difficult, since the fœtus is usually large, but an attempt to drag the large head through the pelvis by its longest diameter with the forceps can only deserve condemnation.

If the head passes the brim it is best to pursue an expectant policy as long as seems consistent with the interests of the patient. Now and then natural delivery will occur contrary to all expectations. If it becomes evident that the efforts of nature are unavailing the forceps should be applied, though an effort to flex the head, thus converting it into an occiput presentation, or if this fails to extend it and thus convert it into one of the face, may be tried. It should be remembered that the configuration of the head, the increase in its vertical diameter, makes it appear that the head is much lower than is really the case. This sometimes tempts the incautious operator to apply the forceps too soon, and perhaps with disastrous results.

In operating with the forceps the axis-traction model should be used, since the greatest diameter of the head is always higher than it appears to be. Whether the operation be forceps or version, if the child is dead craniotomy should be performed.

In the case of a viable child, pubiotomy and symphysiotomy have been advocated and performed. Pinard prefers the Cæsarean section. To my mind, in view of the long diameter that must traverse the birth canal, and consequent danger of severe laceration of the soft parts, Cæsarean section followed by hysterectomy, if infection seems probable, is to be preferred.

CHAPTER XX

FETAL MORTALITY IN LABOR. AN IMPORTANT BUT NEGLECTED SUBJECT. CAUSES, DIAGNOSIS, PREVENTION AND TREATMENT OF FETAL ASPHYXIA. PROLAPSE OF THE CORD

The practice of obstetrics differs from that of general medicine and surgery and from that of the other specialties in many ways, but in no way, I think, is the difference more marked than in the fact that the obstetrician has under his immediate and personal care two patients at one and the same time. This fact is often ignored, and the result is a deplorable increase in fetal mortality. It is, indeed, a sad reflection that many an unborn child, whose potential usefulness and whose capacity for happiness we may not know, is lost for lack of a few simple precautions.

Etiology.—It is neither necessary nor possible that every obstetrician should be an accomplished embryologist and physiologist, but it is necessary that he should be familiar with the various causes of fetal asphyxia and with the mechanism of its production.

The causes may be of either maternal or fetal origin. One would naturally suppose that the oxygen supply of the fœtus depends upon the quality of the mother's blood, but this is by no means always the case. How often do we see strong and vigorous children born of delicate and anæmic mothers. Such instances are often observed in advanced tuberculosis. The child seems to take what it needs, and the mother must get along with the rest. When, however, the mother is suddenly deprived of oxygen, as in cardiac or pulmonary disease with grave cyanosis, fetal asphyxia is rapidly developed.

Fetal Causes.—Among the causes which may be traced to the fœtus or its appendages are prolapse of the cord, not forgetting the concealed form, separation of the placenta, placental apoplexies, etc.

Faulty Operative Technic.—Unfortunately there are many cases which must be referred neither to the mother nor to the fœtus, but to the operator. Faulty technic in the forceps operation and version, and particularly in the delivery of the after-coming head, are common causes of asphyxia and the reader will do well to reread and carefully consider the sections treating of these subjects. It cannot be denied that they often receive too little attention. As we shall see elsewhere the misuse of anæsthetic agents, *e.g.,* chloroform, ether, nitrous oxide, morphine and hyoscine, etc., may result disastrously.

Of all causes, however, that of delayed labor, and especially of delayed second stage, is the most frequent. Of this, too, I have frequently spoken. It is strange that, in the past, prolapse of the cord, a dramatic accident

of rare occurrence, has received so much more attention as a cause of fetal asphyxia than delayed labor, which is its most common cause.

Why does delayed labor result in fetal asphyxia? During the uterine contractions, and particularly after the rupture of the membranes, the uterine interior is diminished in area, and with it, of course, the placental site. Thus the blood supply to the fœtus is diminished and with it the oxygen supply. This, it is true, is of theoretical rather than practical importance during the first stage, but after the rupture of the membranes the diminution in area is considerable, and to this is added the factor of direct pressure upon the fœtus. The fluid medium which has hitherto protected it is no longer present. It is true that the fœtus often withstands the process for an astonishingly long time, but it is not safe to rely upon this.

If the head is large or the pelvis small, there is added the factor of cerebral pressure which may so irritate the vagus as to excite premature inspirations.

Asphyxia Neonatorum

Mechanism.—What is meant by this term? With the complete separation between mother and child which occurs at birth the blood supply from the mother is, of course, cut off and with this the fetal oxygen supply. The accumulation of carbon dioxide in the fetal blood irritates the respiratory centre in the medulla and this is ordinarily the cause of the first inspiration.

But as we have already seen there are many conditions which may cause carbon dioxide poisoning in the unborn fœtus. All these causative factors act primarily in the same way, *i.e.*, by diminishing the amount of oxygen in the fetal blood. The accumulation of carbon dioxide irritates the respiratory centre in the medulla, causing premature inspiratory efforts, but the fœtus *in utero* can find no oxygen in its surroundings. In other cases inspiratory efforts are the results of direct pressure, *e.g.*, in pelvic contraction or in forceps operations.

Whatever the cause, the results are disastrous. The fœtus *in utero* finds no oxygen in its surroundings. With each inspiration amniotic fluid, blood or mucus is drawn into the air passages. The expansion of the thorax opens up the pulmonary circulation, and as a result part of the blood which should flow from the right ventricle into the aorta is diverted, thus lowering the pressure in the umbilical artery and still further diminishing the oxygen supply (Bumm).

Diagnosis.—Whenever any of the above-mentioned causes are present special caution is necessary, and in no case whatever, even in those to all appearances perfectly normal, should the condition of the fœtus escape careful study, since experience has taught us that fetal asphyxia occasionally occurs in cases in which there is apparently no reason whatever to expect it. I do not mean, of course, that it can always be prevented in these cases, but something may possibly be done. At the worst the physician will be conscious that he has not neglected his duty and his patients will have

no just cause of complaint. It follows then that every case of labor should be studied with reference to the question of danger to the fœtus. To wait until after delivery and then speculate as to the cause of the sad result is the height of folly.

What are the indications of impending asphyxia of the fœtus, the immediate indications?

By far the most important are to be found by the auscultation of the fetal heart. Let me repeat here, for the sake of emphasis, that every one who proposes to practise obstetrics should become familiar with the fetal heart-sounds in both normal and abnormal positions. As we already know, the fetal heart-sounds diminish in rate during uterine contractions, only to resume their normal rate during the intervals. When, however, the sounds are reduced to one hundred per minute or less, and this rate continues during the intervals between the contractions, the fœtus is to be regarded as in serious danger and delivery should be completed if this can be done without special risk to the mother. If no relief is afforded, the sounds become still slower and at the same time markedly irregular. This indicates that the fœtus is in great danger but not necessarily altogether beyond hope. If, however, the condition remains unrelieved the heart-sounds become feeble and very rapid, or perhaps quite uncountable and fetal death soon follows.

But there are other signs of danger to the fœtus; less reliable, it is true, but still not to be neglected. Of these perhaps the most significant is the passage of meconium, the result of the paralysis of sphincters resulting from profound asphyxia. In breech presentations or in transverse positions it has no special meaning. In these cases it is simply the result of mechanical pressure. A typical instance is found in breech presentation, of which it is a constant accompaniment. In vertex presentations it is a sign of bad omen and, if the head is within easy reach, an indication for immediate delivery. It is possible, however, for the fœtus to pass meconium *in utero*. Therefore the fetal heart should be auscultated at once while preparations are being made for delivery. If a trained observer recognizes that the sounds are normal in every respect, delivery may be delayed; not otherwise. The fetal heart-sounds, however, should be carefully and constantly watched for the balance of the second stage.

Cessation of fetal movements is of less significance after the beginning of labor than before. It is common for fetal movements to cease, or at least not to be noticed by the mother, after labor begins. On the other hand, unusually active movements of the fœtus are to be regarded with suspicion. Nurses and bystanders often regard such movements as indicative of unusual strength and vitality on the part of the fœtus, but they are only too often the result of the convulsions of asphyxia.

In breech presentation, or during the extraction of the after-coming head in version, one can sometimes see the movements of the chest that accompany premature inspirations.

Varieties.—Two varieties of asphyxia are usually recognized, asphyxia livida and asphyxia pallida. The first is often called blue asphyxia. The second pale asphyxia. Their clinical characteristics soon become familiar to every practitioner.

In the first the surface is congested and the whole body, especially the face, of a livid bluish hue. The heart and umbilical arteries pulsate slowly but strongly. The child may not breathe at first, but responds to peripheral irritation, *e.g.,* a dash of cold water or a few drops of ether poured upon the chest.

In asphyxia pallida conditions are for the most part reversed. The arms and legs hang limply, the head drops back, and the mouth is open. The skin is very waxy, and the child looks as though it had had a severe hemorrhage. Many writers state that the pulse is rapid and weak, apparently thinking that under the circumstances it ought to be. In my experience it is very slow, often not over ten or fifteen per minute, sometimes even less.

Long ago I learned to recognize a third variety. True, it is only a transition stage between the two, but it is highly important from the stand-point of prognosis and treatment. In this variety the child has most of the symptoms of asphyxia pallida, but there is still some little congestion of the face. Response to peripheral irritation is not entirely lost, and in my experience can usually be evoked by tongue traction.

It is impossible to mistake the livid for the pallid asphyxia. Indeed, as soon as the head is born the diagnosis can be made, and the experienced operator rejoices at this time if, after a difficult delivery, he notes lividity of the face, instead of the dreaded pallor, which always indicates that the child is in extreme peril.

Preventive Treatment.—The very general neglect of the preventive treatment of fetal asphyxia is a reproach to the practice of medicine. Too many pay little attention and give little thought to the welfare of the unborn child. It is usually taken for granted that the child will eventually be born *per vias naturales,* probably alive, possibly dead. In the latter case the result is too often regarded as a dispensation of Providence, or at all events as something beyond the power of the physician to prevent. Quite the contrary is the case. Even a superficial study of the matter will suffice to show that it is rich in possibilities for good.

It cannot be too often repeated that asphyxia of the new-born is but an advanced stage of a process that begins before delivery, sometimes long before delivery, and that it is, in most cases, preventable. The whole management of labor and the technic of the various operations should be studied from this point of view, and I have striven to emphasize the details through this work. Of special importance are the limitation of the amount of the anæsthetic, the avoidance of forceps compression and the prompt and skilful delivery of the after-coming head. The time to think of and to prepare for all these things is while the child is still alive and the fetal

heart is still good. He who does not attend to these matters is sure to meet with disaster "in the long run."

I have referred elsewhere to certain studies of my own in connection with oxygen in the treatment of eclampsia and in the toxæmia of pregnancy, and, without wishing to attach undue importance to my own work, I may perhaps venture here to call attention to certain immediate effects upon the unborn child, of oxygen *administered to the mother,* which were observed in the course of my experiments at the New York City Hospital, and which had, I think, up to that time escaped attention.

In the first place, the inhalation of oxygen by the mother appears to increase the rapidity of the fetal heart. I have before me the notes of eleven tests made at the City Hospital. Each test consisted in the inhalation of oxygen for five minutes by a pregnant woman at or near term, the fetal heart being counted before and after inhalation. Fetal movements were also observed and uterine contractions noted. In order to eliminate the personal element I did not do the counting myself, but entrusted the task to one of my assistants. The rapidity of the fetal heart-sounds was increased in every case. In two cases the increase was so small as to be practically negligible, two and four beats respectively; in a third it was eight beats, and in the remainder it was from sixteen to twenty-five beats. The average increase was about fifteen beats. The real increase was somewhat greater than is here indicated, since the inhalation of oxygen appears to excite uterine contractions, and in at least four cases the counting was done during a contraction. It is a matter of every-day experience that the fetal heart beats more slowly during a contraction.

Another new and curious fact noted during these experiments is that oxygen increases the frequency and activity of the fetal movements. Out of nine tests it was found that the fetal movements were increased in five. In three of these they were marked simply "increased" and in the remaining two "markedly increased." In the case of one patient near term and since delivered, the fœtus underwent remarkable contortions, but without harm.

Why do the fetal heart-sounds become more rapid, and the fetal movements more active, under the influence of oxygen? Certainly not because of a general stimulation of the maternal organism. Drugs given by the mouth or hypodermically do not ordinarily affect the fetal heart. The fetal and maternal circulations, however, are really one, and if oxygen enters into chemical combination with the maternal blood, how can the blood of the fœtus escape its influence?

Now if we can administer oxygen to the fœtus, and if the fœtus responds symptomatically to that administration, is it not plain that we can do much in the prevention and treatment of antenatal asphyxia? The normal slowing of the fetal heart during contractions usually does no harm, but if the labor is much prolonged or if the contractions become tetanic in character, the fœtus will sooner or later show the effect of the

diminished supply of oxygen. During a uterine contraction there is, of course, a corresponding diminution of the placental area. The fœtus thus receives less blood and consequently less oxygen. In our experiments at the City Hospital the fetal heart-sounds were increased in frequency during the contractions. Therefore it would seem a wise precaution to administer oxygen to the mother in cases of prolonged second stage, in partial separation of the placenta, or whenever slowness or irregularity of the fetal heart-sounds indicates impending asphyxia.

I am aware that there are many sources of error in counting the fetal heart, but the fact that in eleven cases an increase was noted in every case, that the average increase was about fifteen beats per minute, and that in some cases it was as high as twenty-five beats per minute, and that in a large number of cases the fetal movements were increased, sometimes markedly so, seems to indicate that the inhalation of oxygen by the mother is not without its effect upon the fœtus.

In two subsequent tests conducted in the same manner the heart rate was increased ten beats per minute and fetal movements were observed.

Shortly after this, one of my house surgeons, whose name I do not now recall, had an opportunity of witnessing the stimulating effect of oxygen upon the fœtus during a difficult version. With his hand in the uterus he distinctly felt fetal movements immediately following the administration of oxygen to the mother.

Since the above experiments were made I have continued the use of oxygen in difficult labor and in obstetric operations with a view to preventing prenatal asphyxia, and with apparently favorable results. Several of my colleagues have had the same experience.

On the basis of these experiments I have been in the habit of advising that whatever anæsthetic is used in obstetric operations be given with a large admixture of oxygen in order to minimize the danger of fetal asphyxia from the anæsthetic as well as from causes incident to the operation itself.

At the present time there is in one of the wards of the City Maternity a patient suffering from placenta prævia. She was an ambulance case, had been bleeding for some time before admission, and was beginning to show symptoms of acute anæmia. The cervix barely admitted three fingers. A foot was brought down and traction upon this brought the half breech into the cervix, which, however, was hard and not very dilatable. The bleeding now ceased but forcible extraction or other operative procedure was not deemed advisable. The fetal heart rate was 136. Oxygen was administered, whereupon the rate rose at once to 160. About forty-five minutes elapsed between the bringing down of the breech and the delivery of the head. During this time moderate traction was made upon the fetal leg in order to control the bleeding. Meanwhile oxygen was administered and the fetal heart was constantly watched. Shortly before delivery it became very rapid (190) but remained of good quality. The child was in excellent condition and no measures of resuscitation were required.

Another patient, also in the hospital at this writing, was admitted suffering from profound toxæmia. The usual treatment, rest in bed, milk diet, catharsis, etc., was supplemented by frequent inhalations of oxygen and marked improvement followed. The treatment, however, including the inhalations, was continued. At the end of a week I questioned her as to the immediate effects of the inhalations. In reply, she stated among other things that during or after these she "felt the baby kicking." I had said nothing about the child nor was I thinking of the effect of oxygen upon the fœtus at the time.

This unsolicited and unsuggested testimony of the patient, a very intelligent woman, confirming as it does the observations mentioned above, is to my mind highly significant.

I desire to emphasize the fact that in order to eliminate the personal element I did not do the counting of the fetal heart myself. It was done in every instance by a member of the house staff, but not always by the same member. The fetal movements, too, were observed by different members of the house staff, with the single exception of the case referred to above, in which they were observed many times by the patient herself.

Another patient, now under treatment in a private hospital, gave similar testimony, and adds the interesting information that when the oxygen is given by one of her nurses, who is evidently a convert to this method of treatment, the effect upon the fœtus is much more marked than when it is given by the other nurse, who is less prodigal in its use and is evidently working in the interest of hospital economy.

I have no further hesitation in making the claim that it has been definitely proven that we can administer oxygen to the fœtus, and that the fœtus responds to its administration.

Curative Treatment.—In every labor case, and especially in every operative case, everything necessary for the resuscitation of the child *should be provided in advance*. The requisites are few and inexpensive. Their absence may mean irremediable harm. They include two large bowls, one for hot the other for cold water, a tongue forceps for tongue traction, and a laryngeal tube for aspirating mucus from the air-passages and for insufflation. The traditional catheter so often advised is an abomination. Even an expert intubator will be unable to achieve results with it. Oxygen should be at hand if obtainable; also a pulmotor.

In the first place, be sure that the child is asphyxiated before instituting radical measures of treatment. After prolonged operations, children are often born profoundly narcotized by the anæsthetic circulating in the mother's blood. These children, although breathing regularly, do not cry, and for this reason are often subjected to manipulations which are unnecessary and perhaps injurious.

It is important to remember that the treatment varies with the type of asphyxia. Measures that are appropriate in the severe forms are, to say the least, unnecessary in the mild form (Figs. 244 and 245).

In the ordinary type of asphyxia livida, simple reflex stimulation suffices. The child is held by the feet, the head hanging down. This position helps by gravity to dislodge fluid from the air passages and is

FIG. 244.—Treatment of case of asphyxia livida.

aided by rhythmical compression of the chest. The cerebral congestion induced is of itself beneficial. The little finger wrapped in gauze clears the mouth and pharynx of mucus. The nares may be effectually emptied

by blowing into the child's mouth through a piece of gauze. Very often the contact of the finger with the fauces is sufficient to excite inspiration. If not, cold water or a little ether may be dashed upon the chest. These

FIG. 245.—Same with rhythmical compression of chest.

measures are usually promptly successful. If respiration is delayed, however, the child should be immersed alternately in warm and in very cold water. This old-fashioned measure often succeeds when previous methods

have failed. It may be combined with the Harvie Dew method of respiration, which in my hands has proven very satisfactory. If the case is still refractory, the child should be immersed in warm water, and

Fig. 246.—Tongue traction. An invaluable resource in asphyxia neonatorum.

wrapped in warm blankets and tongue traction tried (Fig. 246). In this procedure the tongue is seized with a pair of tongue forceps and drawn out until the operator meets with distinct resistance, held in this position for a second or two and then allowed to recede. This is repeated but not

too rapidly; about fifteen times a minute. Very often the child gasps after the first traction and after each succeeding one. If a tongue forceps is not at hand a tenaculum may be used. I have several times been obliged to resort to this and have never found that the tiny pricks in the tongue did any harm. In my hands tongue traction has proven more valuable, by far, than any other method of peripheral irritation, more valuable, indeed, than artificial respiration, and if it evokes no response I always feel that the prognosis is grave. It is especially valuable in those cases of intermediate type approaching closely the true asphyxia pallida. Most of the reported cures of asphyxia pallida are of this kind.

The student naturally asks, "How is respiration furthered by making traction upon the tongue?" The explanation is as follows. The pull upon the base of the tongue irritates the superior laryngeal and other nerves and this irritation is transmitted reflexly to the phrenic nerves,

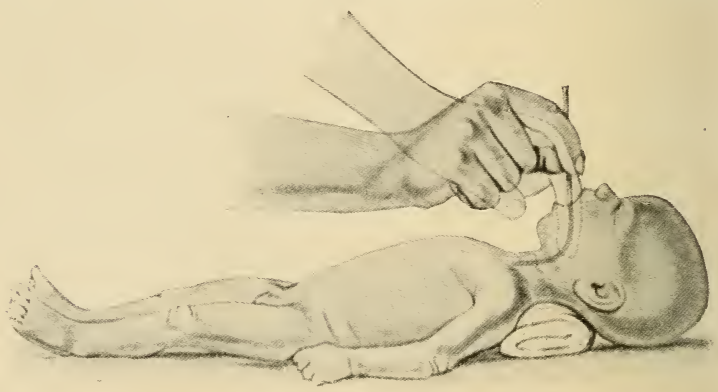


Fig. 247.—Introduction of laryngeal tube.

which govern the diaphragm and intercostal muscles. As is well known, tongue traction is one of the best means of reëstablishing suspended animation in chloroform poisoning. The efficacy of the procedure is increased by combining it with oxygen inhalation.

In well-marked asphyxia pallida there is no response to peripheral irritation, not even to tongue traction. The medulla no longer reacts to the usual methods of stimulation. The air passages are full of mucus, even to the smaller bronchi. The problem is to get oxygen into the lungs. But first the mucus must, as far as possible, be removed. How shall this be accomplished?

The pharynx and nostrils are first cleared as already described. The next step is the passage of the tube into the larynx. The index finger of the left hand locates the laryngeal opening by means of the arytenoid cartilages, which are easily felt, and its radial border serves as a guide for the tube, which is passed with the other hand. This manœuvre is not

always easy, and I would strongly advise those of my readers who are not familiar with the technic to practise it upon the cadaver whenever the opportunity offers (Figs. 247 and 248).

FIG. 248.—Method of using the laryngeal tube.

When the tube has entered the trachea, the fact can be determined by giving its tip slight lateral movements (Jeannin). These are easily appreciated by the finger applied externally. The operator then places a few layers of gauze over the outer end of the tube, sucks the contents of the

trachea into the tube, removes the tube, and blows out the contents. This is repeated until the trachea is empty.

The tube being replaced, the operator, having expelled the residual air from his lungs, blows a little air very gently into the tube. In order that the air may contain as much oxygen as possible, he should take only a superficial inspiration before blowing into the tube. If air enters, the lungs

Fig. 249.—Holden's oxygen insufflation.

will be observed to expand. The chest is then lightly compressed with the hand, thus favoring expiration. This manœuvre is repeated from six to eight times a minute.

Mouth to mouth insufflation, while not as direct or as effectual as insufflation through the tube, has the advantage of simplicity and ease of performance. No instruments are required and it can be performed by any intelligent layman. The child lies on its back with head moderately extended. The operator blows into the child's mouth through a piece of

gauze and with the precautions above mentioned. Doubtless much of the air enters the stomach rather than the lungs. An effort is made to prevent this by gentle pressure with one hand over the epigastric region. Expiration is encouraged by compressing the chest wall with the hand.

FIG. 250.—Harvie Dew's method of artificial respiration; inspiration.

Holden's method of direct oxygen insufflation is in my opinion the best of all methods of artificial respiration. It has been extensively used in the clinic of Polak, from whom this description is taken. "The child is laid on its back, in a bath of warm water, with the head partially extended, to

straighten the trachea. The hand is placed under the shoulders and the neck allowed to rest in the cleft between thumb and index finger, which steadies the head. A close-fitting mouthpiece, or small rubber funnel connected by rubber tubing to an oxygen tank, is then firmly placed over the

FIG. 251.—Harvie Dew's method of artificial respiration; expiration.

child's mouth and the oxygen turned on. Almost immediately the rate of heart-beat will be increased and the cyanosis of the skin changed to pink, while upward stroking of the chest wall along the long thoracic nerve will cause the child to make inspiratory efforts " (Fig. 249).

The much vaunted and widely advertised pulmotor is perhaps of spec-

tacular effect rather than of real advantage. Much of the air supposed to be inspired escapes about the mouthpiece and a large part of the balance enters the stomach rather than the lungs. In mouth to mouth insufflation the air, having already been breathed once, is more or less vitiated. Holden's method is practically the use of the pulmotor except that oxygen is used instead of atmospheric air. Bearing in mind the relatively small quantity that enters the lungs under the older method the advantages of the Holden method are obvious. Unfortunately the facilities for its use are not usually found outside of hospitals.

Engelman has recently devised an apparatus for giving oxygen through the tracheal tube.

It is very generally taken for granted that artificial respiration plays the principal rôle in the scientific treatment of asphyxia neonatorum. As a matter of fact this is by no means the case. As a reflex excitant of inspiration it is inferior to tongue traction and to the alternate use of hot and cold water, while for keeping up the oxygenation of the blood it does not serve as well as oxygen insufflation, or insufflation, through the laryngeal tube. Certain forms, however, do aid materially in bringing about the expulsion, emptying the air passages of mucus.

Fig. 252.—Prochownik's method of resuscitation.

Of the various methods of artificial respiration I prefer that of Harvie Dew, which affords very complete expansion and contraction of the thoracic cavity, more, I think, than most other methods, permits the very frequent immersion of the child's body in warm water, and as can be easily demonstrated is very effectual in the removal of fluid from the air passages. This method, which can be more easily illustrated than described, is well shown in Figs. 250 and 251.

Another good method is that of Prochownik, in which the child is suspended with the head downward and the chest compressed at intervals. Extension of the head is favored by allowing the forehead to rest lightly upon a folded sheet, as shown in Fig. 252. This method has the advantages

of inverted suspension and involves no traumatism whatever. It also favors the expulsion of fluids from the trachea. It is especially valuable in the case of exhausted or premature children.

FIG. 253.—Sylvester's method; inspiration.

The well-known method of Sylvester, familiar to all life savers and students of "first aid," is of little use in the new-born, since the bones and their cartilaginous attachments are not yet strong enough to serve as

media for the expansion of the thorax. Nor is it very effectual in emptying the air passages (Figs. 253, 254, and 255).

The classical "swingings" of Schultze, which I have often tried but

FIG. 254.—Sylvester's method; expiration.

now seldom use, are unnecessary in the milder cases and useless in the very serious ones.

This is the conclusion of Fabre, Ayers, and many others. That they are

mechanically efficient can be readily shown, but that they are often dangerous is equally evident. They are quite inapplicable in the case of premature children, and should, of course, never be used in cases of fracture.

FIG. 255.—Sylvester's method with tongue traction.

Their extensive use in the past, however, together with the fact that they still occupy a prominent place in the literature of the subject, not to speak of their occasional mention in examination papers, makes it necessary that

the student should know something about them. Figs. 256 and 257 show the method of their employment better than it can be done by a printed description.

FIG. 256.—Schultze's method; inspiration.

Many writers, especially upon the continent of Europe, forbid the use of any form of artificial respiration until the trachea has been cleared by insufflation. This, of course, is theoretically correct, but to attempt to carry it out in practice is, I think, to go too far. Such an attempt assumes

that every obstetrician is a good intubator, that intubation is always easy, and that the results of insufflation are always satisfactory. As a matter of fact the most effectual methods of artificial respiration, those for example

FIG. 257.—Schultze's method; expiration.

of Schultze, Prochownik, and Harvie Dew, act chiefly by mechanically removing inspired fluids. Moreover, all theoretical considerations aside, experience shows that in livid or congestive asphyxia these methods are often followed by good results. I am therefore in the habit of advising

artificial respiration in those cases in which with congestive asphyxia there is evidence of fluid in the air passages, though more with the idea of emptying the air passages than of stimulating inspiration, nor should it be continued too long; for the latter purpose peripheral stimulation in the form of the hot and cold plunge or of tongue traction. In pallid asphyxia insufflation in some form should always come first. In these there have usually been many inspirations *in utero* and the larynx and smaller bronchi are full of fluids which can hardly be completely removed by any method of artificial respiration.

Whatever method of resuscitation be employed, as soon as respiration has been established and improvement, though slow, is progressive, the child should be wrapped in warm blankets and let alone, further handling being avoided. One thing aids, however, in bringing about rapid recovery —the inhalation of oxygen. Of course, if there are no respiratory movements oxygen, except by insufflation, can do no good, but in those cases in which inspirations are shallow and infrequent prompt results are sometimes seen. The action of oxygen upon the fœtus is very prompt and certain.

The operator should not forget that his duty at this time is not only to save the child from immediate death from asphyxia but from subsequent death from atalectasis. Many children while appearing to be strong and in fairly good condition yet retain much mucus in the air passages. It is in these cases that artificial respiration has seemed to do most good and those methods which favor the removal of mucus from the air passages.

Deeply asphyxiated children though revived are by no means out of danger. Cerebral compression or hemorrhage may have left ineffaceable marks, or the child may die of atalectasis within a day or two. Therefore these children should be carefully watched. All tight clothing or bandages which may interfere with free expansion of the thorax should be tabooed (Jeannin). The inspiratory reflex should be stimulated, so that the child cries vigorously, insufflation repeated if necessary, and above all oxygen should be administered.

For the first two or three days the prognosis should always be guarded and provisional.

In most discussions of this subject one finds nothing about the treatment of asphyxia in premature children and the reader is left to infer that it is the same as in robust infants born at full term. This, it seems, is a grave error. As a rule the principal trouble with these children is debility rather than respiratory obstruction. The rougher methods and particularly "swingings" of Schultze should be avoided. Bearing in mind the fact that the heat-producing mechanism in these cases is defective, the judicious physician will employ for the most part those which can be practised with the child wholly or partly immersed in warm water. Tongue traction has seemed to me less beneficial in these cases than in full term children, though it should always be tried if other methods fail. Oxygen I believe to be of special value in these cases.

Before artificial respiration, clear the upper and if necessary the lower air passages, thus avoiding inspiration of mucus. As soon as respiratory movements are regular and little or no mucus is in the air passages the child should be kept warm and quiet and let alone.

Two things more. Loss of bodily heat is most depressing to the new-born. Manipulations should be carried on as far as possible with the child in the warm bath or wrapped up in warm blankets. Loss of heat by evaporation is rapid. This should be remembered when practising the different methods of artificial respiration.

Unnecessary manipulations should be avoided. Slapping the buttocks and similar methods are quite unnecessary and have often been known to cause serious injury. Rupture of the liver and of the suprarenal capsules has been noted. A dash of cold water or an instant's plunge in the cold bath accomplishes the same result and with no harm.

Summary.—Clear and correct descriptions of the treatment of fetal asphyxia are rare, and some writers seem to have no positive opinions at all on the subject. Very often a medley of methods is presented with no reference to their relative importance or to the order in which they should be used. The result is great confusion in the mind of the student or young practitioner. Therefore a brief summary of the main things to be remembered may not be out of place.

Congestive Asphyxia.—This is the usual or milder form. Suspend the child by the feet and cleanse the pharynx and nostrils as already described. Then tie the cord. A dash of cold water or ether upon the chest usually suffices to cause inspiration, the child cries vigorously, and no further treatment is required. If there is no response to this treatment, use the hot and cold water dip alternately, and practise tongue traction. If there is no response to tongue traction properly performed the prognosis is grave. The case is one of the border line variety or is rapidly becoming one of pallid asphyxia.

Pallid Asphyxia.—Here the time for peripheral irritation has passed. The medulla no longer reacts. Aspiration of mucus from the trachea by the tracheal tube and insufflation by the same instrument or Holden's oxygen insufflation offers a hope of success; a rather forlorn hope, it is true, but one which should not be given up as long as any heart-beat can be detected.

Prolapse of the Cord

By this term is usually meant the descent of a loop of the cord in advance of the presenting part. In this case the cord is plainly perceptible to sight and touch. There is another form, however, usually neglected or ignored, but of the greatest importance, in which the cord descends far enough to be compressed by the presenting part but not far enough to be seen or felt by the usual methods of examination. There are then in reality two kinds of prolapse, visible and concealed.

Ordinarily the descent of the cord is prevented by the presence of the smooth globular vertex. When, however, the presenting part does not completely fill the lower uterine segment the natural safeguard is absent, and the escape of a loop of cord an easy matter. Hence it is easy to understand why prolapse of the cord is often found in the case of certain malpositions and malpresentations, *e.g.,* in breech, face, and transverse cases and when a tumor or a pendulous abdomen, or a contracted pelvic brim prevents the descent of the vertex.

Predisposing causes are unusual length of the cord, and marginal insertion of the cord or low insertion of the placenta, both of which cause a relative lengthening.

Whatever the ultimate cause prolapse is most likely to occur at the time of rupture of the membranes, especially if there is an abnormal quantity as in hydramnion, or if the patient happens to be standing at the time.

Diagnosis.—Prolapse of the cord can hardly be mistaken for anything except prolapse of a loop of intestine through a rent in the uterine wall. In that case, however, pulsation is absent and the mesentery can be felt. Furthermore there will be a history of uterine traumatism.

It is most important to determine whether the fœtus is living and viable, for upon this the treatment depends. The necessity for this determination occurs much more frequently than does the necessity for the differentiation between prolapse of the cord and intestinal prolapse. Nor should the attendant forget to inquire as to the period of pregnancy. I was once called in great haste to see a case of prolapse of the cord. There was no doubt as to the diagnosis, since a loop of cord protruded from the vulva. The abdominal tumor, however, did not seem to correspond to that of full term and careful questioning elicited the fact that pregnancy was of less than seven months' duration. In some cases the best thing is to do nothing.

The diagnosis of the death of the child, however, is not always easy. The mere absence of pulsation in the cord is not always sufficient, as experience has shown. If, however, it is accompanied by cessation of the fetal heart-sounds, as recognized by a competent examiner, the diagnosis becomes more positive in some cases, *e.g.,* in those in which there has been long compression or in which all doubt is absent, and these are the most satisfactory with which to deal.

Prognosis.—There is no danger to the mother in prolapse of the cord *per se,* but there may be in the operations proposed and carried out for its relief. The fetal prognosis varies with the attendant circumstances. In head presentations, however, it is always very grave, probably under present methods 50 per cent. or more. More so when the prolapse is anterior than when posterior, where there is more room. The earlier the period of labor the worse the prognosis. It is made much more grave by rupture of the membranes. In breech and shoulder presentations it does not add greatly to the danger.

This is one of the most serious emergencies of obstetric practice.

While it is not very common it is just as likely to happen in the practice of the beginner as in the hospital operating room. The life of the child is at stake and as a rule there is no time to be lost.

Let us take first what is perhaps the most common case. The cervix is fully dilated, or at all events will admit two or three fingers, and is soft and easily dilatable. The prolapse has been determined during an examination made during labor. If under these circumstances the conditions are favorable for version and if the operator has attained some familiarity in its performance, and especially if he is skilled in the delivery of the after-coming head, version is, in my opinion, the best procedure, far better than repeated attempts to replace the cord, which after all may be unsuccessful. In performing version the operator is simply seeking to produce conditions which in prolapse of the cord are favorable. He is seeking to substitute for the round, hard head of the fœtus so dangerous as a cord compressor, the soft irregular bulk of the breech, which in this respect has but little effect. The mortality in versions and in breech presentations is, it is true, considerably higher than in vertex presentations, but not nearly as high as in the latter presentation, when complicated by prolapse of the cord. But in these cases version, if it is to be performed at all, must be performed at once. Here it is true, only too often, that he who hesitates is lost.

In most cases it is best for the child that immediate extraction should follow, since the child may have already sustained more or less injury. If, however, the cervix is hard and undilatable it may be necessary to delay in the interest of the mother. It is true that the condition of the child is not enviable, but it is less precarious than before.

Treatment.—If the membranes have not ruptured the patient should be placed in the latero-prone position with the hips elevated upon a pillow or with the aid of a chair in the Trendelenburg position. The patient should be carefully watched, but unnecessary examinations should be avoided at this stage. Every effort should be made to preserve the membranes intact. If rupture can be postponed until the cervix is completely dilated the chances of saving the child are much enhanced and operative delivery much less dangerous to the mother. The fetal heart should be auscultated at frequent intervals.

Before rupture of the membranes, then, there is little to be done. After their rupture an immediate investigation is necessary. The treatment now depends upon the condition of the cervix.

If there is but slight dilatation, and especially if the cervical canal has not been effaced, those most interested should be consulted and the situation made plain to them. If the fetal heart-sounds are good there is every prospect of securing a living child by the Cæsarean section, whereas by the usual methods of treatment the chances of its survival are slight. Then, too, we must not forget that pelvic contraction is one of the causes of prolapse of the cord. Of course, the operator must be competent and the surroundings favorable.

But suppose that this proposition is rejected, or that conditions forbid the Cæsarean section. The cervix is hard and undilated, and perhaps the canal persists. These unwelcome and fortunately rare cases were formerly treated by the repositor, and nearly all of them were lost. A gauze tampon in the cervix serves to prevent the descent of the cord, and to bring about dilatation of the cervix. A de Ribes bag accomplishes the same objects but requires more experience and facility in obstetric operating.

An improvised repositor is shown in Fig. 258. It may be made from a hard rubber catheter or some similar instrument. The cord is caught within the loop and carried high above the point of pressure. The patient is kept in the Trendelenburg position for some time. The repositor may be left *in utero* to be expelled with the pains. This ancient instrument, figured in all the text-books, has of late fallen largely into disuse. The cord is likely to be twisted or compressed and to come down again. Repeated efforts may cause premature inspirations with resulting fetal asphyxia, and the necessary intra-uterine manipulations increase the danger of infection. Where there is room the hand is a better repositor. However, in rare instances with narrow cervix and canal preserved, a repositor might be indicated.

Fig. 258.—Improvised repositor.

In the great majority of these cases, however, it would be better to use a de Ribes bag. With the patient in the Trendelenburg position, the largest bag that can be passed through the cervix is introduced and inflated. This is a distinctly modern and efficient method of treatment. The bag helps to keep the cord from descending and furthers the dilatation of the cervix, thus helping to restore the conditions existing before rupture of the membranes. The process, however, requires considerable dexterity and constant supervision and therefore as soon as there is sufficient room to perform podalic version it is wise to do so.

As soon as the child has been turned and a foot brought down it is usually wise to complete delivery without delay since the child has perhaps already been more or less shocked. If, however, owing perhaps to an unyielding cervix or to the general condition of the mother, extraction cannot be immediately performed, the child is at least in a more favorable position than before.

Under these circumstances it is better, contrary to the usual rule, to bring down one foot rather than two, thus blocking up the pelvis more completely and tending to prevent further escape of the cord. The fetal heart should be narrowly watched.

Some writers advise that the cord be carried up and attached to a leg of the fœtus by means of the hand introduced into the uterus. This is about as much of an operation as is version and, in my opinion, should be

reserved for those cases in which version is likely to prove difficult, *e.g.*, in which the patient is a primipara and the fœtus overgrown.

After all efforts at reposition the patient is placed for a time in the knee-elbow position and then for a time in the latero-prone position with the hips elevated. The patient should lie upon the side toward which the cord does not escape. The fetal heart should be auscultated at frequent intervals during the balance of the labor.

If the child is dead perforation should be done in order to save the mother unnecessary traumatism.

Let us sum up the matter.

If the membranes have not been ruptured they should be preserved as long as possible.

If the membranes have been ruptured and the cervix is dilated or easily dilatable and other conditions are favorable version offers the best prospect of success.

If, on the other hand, the cervix is not easily dilatable the cord should be replaced by the hand or by a repositor and prevented from falling by a gauze tampon or a de Ribes balloon, and by keeping the patient in the knee-chest or the Trendelenburg position.

Concealed prolapse is likely to escape the notice of any except the most careful men and those who have attained some mastery of obstetric technic. Slowness or irregularity of the fetal heart, without apparent cause, occurring when the head is down in the pelvic cavity, and the heart sounds have previously been normal, and accompanied perhaps by a murmur, is highly suggestive. The same symptoms sometimes follow the application of the forceps, as is noted in the chapter on the forceps operation. If the hand is introduced into the vagina, and the fingers carried well up into the cervix the cord may be felt. The treatment is the application or reapplication of the forceps in such a way as to avoid compression of the cord if this has taken place. If compression cannot be avoided delivery should be as rapid as is safe. The operator, however, should remember that version is sometimes practicable even when the head is low in the pelvis, and if not contra-indicated is preferable to much compression of the cord with the forceps.

CHAPTER XXI

LACERATIONS OF THE GENITAL TRACT DURING LABOR

LACERATIONS OF THE PERINEUM AND VULVA. LACERATIONS OF THE VAGINA. LACERATIONS OF THE CERVIX. HÆMATOMA. RUPTURE OF THE UTERUS. INVERSION OF THE UTERUS

The Repair of Perineal Lacerations (Primary Perineorrhaphy)

The subject of the repair of perineal lacerations is usually assigned to the pathology of obstetrics, but since these lacerations are so common, and their repair a necessary part of the conduct of many labors, especially first labors, I have thought it best in a practical work like this to include the whole subject in the consideration of the management of labor. I believe that the student and reader should be made to understand that the prevention and repair of all varieties of perineal laceration is an integral and indispensable part of said management. Certainly no man who is unable or unwilling to unite the ends of a divided rectal sphincter should desire to undertake the responsibility of managing a case of labor. In the chapter on normal labor we have considered the etiology and prevention of these injuries. Let us here take up briefly the question of their repair.

As already stated the physician cannot always be blamed because his patient has a perineal tear. He should, however, and perhaps will, be blamed, if he makes no attempt at repairing the tear. Now and then it is true his patient may be in a condition of shock as the result of some grave operation, or may be suffering from the results of hemorrhage, and he may be quite right in assuming that she should be subjected to no further disturbance, but in these cases the repair can usually be made a day or two later.

More important than the question of praise or blame is the fact that repair is necessary in the interests of the patient. Even tears of the first degree, if unrepaired, increase the risk of infection by presenting an area of raw surface at the vulva where postpartum contamination is most likely to occur. The "puerperal ulcer" of the older writers is simply a streptococcic membrane covering the site of an unhealed perineal tear.

Tears of the second degree involving the perineal body and the vagina entail a train of consequences, immediate and remote, that soon become familiar to every observant physician; gaping of the vaginal orifice, with partial descent of the vaginal walls, going on perhaps to cystocele, rectocele, or both, as well as to partial or even complete prolapse of the uterus. The well-known fact that these results do not always follow constitutes no justification for neglect. The tragic results of neglected tears of the third degree are common knowledge. In addition to the consequences above

mentioned, the patient's life may be made a burden to her by loss of rectal control.

Time for Operating.—When should the laceration be repaired? At once, if circumstances are favorable, *i.e.*, if the patient's condition is good and if the operator is competent for the task. It is the custom of many men to insert the sutures while waiting for the delivery of the placenta, not tying them, of course, until the placenta has been delivered. This is convenient and permissible in slight tears involving only the skin and mucous membrane, but obviously improper in cases of severe laceration. Such cases require the entire attention of the operator, and should be postponed until he is relieved of all anxiety about the condition of the patient, the delivery of the placenta, the possibility of hemorrhage, etc.

Many an operation has been omitted or imperfectly performed because the circumstances were unfavorable, *e.g.*, because the patient's general condition was not good, or the necessary assistance was not at hand, or the attendant distrusted his ability to perform a difficult perineorrhaphy, and perhaps supervise the administration of an anæsthetic when exhausted by anxiety or loss of sleep. In a case like this it is far better, after irrigation of the vulva and covering the parts with a sterile dressing carefully held in place, to wait from twelve to thirty-six hours. The patient will then have recovered from the shock of labor, and the operation can be carefully and deliberately performed, under ether anæsthesia, if necessary, by a good light, and with the necessary assistance. Moreover, as I have recently become convinced by experience, the operation performed at this time is much easier. The swelling has subsided, the relations of the parts can be better determined, and the operator's view is not obstructed by the constant flow of blood and liquor amnii. If this practice were generally followed, we would not so often meet with cases in which one or two hastily placed sutures at the vaginal outlet conceal a serious laceration within.

Technic.—The repair of perineal tears is always a difficult matter for the beginner. Indeed, many never acquire correct ideas upon the subject at all. Circumstances render it difficult or impossible to photograph the various steps of the operation and the efforts to enlighten the beginner by means of diagrams have proven a colossal failure. Some of these diagrams are utterly incomprehensible, even to those who have given much thought to the subject, and certainly represent nothing that one sees in real life. Experience has taught me that it is better to master the general principles that underlie the subject, to avoid a multiplicity of diagrams, and for the rest to trust to a good light and a sufficient knowledge of anatomy.

Few instruments are needed. Needles should be strong and have a large and sweeping curve, about that of a half-dollar. Small and fragile needles are useless and inefficient in making the circuit of the swollen tissues and are likely to be broken in the attempt. A good needle holder is a necessity. Very useful and much to be preferred, especially for sewing up tears in the sulci, is the Emmett needle with an eye in the point. Two

pairs of volsella will be found very convenient for seizing and defining the angles of the tear (Fig. 259). Silkworm gut is the preferable material for suture. It is cheap, easily disinfected—simple boiling suffices—and does not absorb the lochial secretion and thus cause stitch abscesses. Fine catgut should be at hand, however, for buried sutures, should these be necessary, *e.g.*, in uniting the ends of the rectal sphincter, or in sewing up the recto-vaginal septum.

A good light and a good view of the field of operation are indispensable. The operator should spare neither time nor pains in securing these. Perhaps it is not too much to say that this is the most important of the whole procedure. Once he has determined exactly what he has to do, the battle is

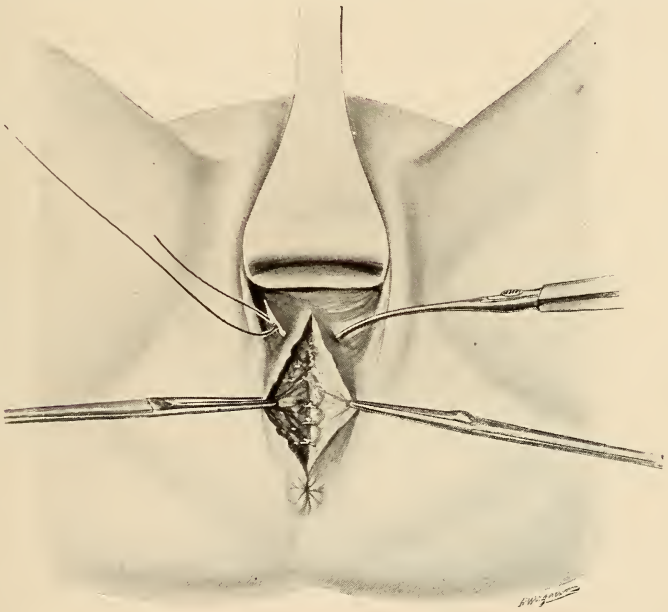


FIG. 259.—Showing Emmett needle and use of the volsella.

more than half won. The placing of the sutures is a mechanical matter of no great difficulty, but there are a few simple rules which it is important to remember.

For easy operations it may be sufficient to place the patient in the cross-bed position, but in the case of a complete tear, or one which extends up one of the vaginal sulci, a table should be used. There should be no hurry or excitement, and everything should be done with deliberation and care. The patient should be in the dorsal position with the hips drawn to the edge of the table, and the vulva and adjacent parts washed with lysol solution. A sterile towel or one wrung out of lysol solution is placed under the buttocks.

The first thing required is a systematic inspection of the parts by a good light. Wide separation of the labia together with free irrigation is usually sufficient. In the case of a primipara it should be remembered that an apparently normal condition of the external parts may coexist with an internal tear, and it is sometimes advantageous to evert the posterior vaginal wall through the rectum, paying special attention to the lateral fornices. If this is done, a glove should, of course, be worn and then discarded. Inspection to be thorough should be systematic. The attendant should first satisfy himself that the sphincter ani and the recto-vaginal septum are intact. This is usually easy. The parts are directly accessible to sight and touch. In case of doubt the finger introduced with the precautions just mentioned will settle the question.

The next step is the inspection of the perineal body. This may be accomplished with a little care by separating the labia and irrigating or sponging the parts, a tampon being inserted meanwhile in the upper part of the vagina to diminish the flow of blood and liquor amnii over the parts. Do not overlook a pocket that is often found behind an apparently intact posterior commissure. Do not forget to remove the tampon.

The third step *never to be omitted* is the inspection of the posterior vaginal sulci. This is the most troublesome part of the whole procedure, but with care can always be accomplished. If the sulcus is not the seat of a tear its congested mucous membrane will present an unbroken surface when the flow of blood from above is temporarily checked or wiped away. If a tear is present the blood wells up from below and is constant, even if the flow from above is stanched. With careful sponging the edges of the tear can be made out. In case of doubt, palpation of the parts by two fingers, one in the vagina and the other in the rectum, is of the highest value, enabling one to recognize immediately the break of continuity in the muscle. It is in these cases particularly that the advantages of the delayed operation are apparent. There is little or no bleeding and accurate coaptation of the parts is an easy task.

Asepsis should be rigid. Meddlesome antisepsis is to be avoided. Experience has shown that if care is exercised in this respect good results are usually obtained. An extra pair of gloves should be at hand since the operator may be obliged to introduce a finger into the rectum. Douches, either before or after the operation, are best omitted but the external parts should be thoroughly scrubbed with lysol solution, and the field of operation frequently irrigated with the same solution. After the operation is completed a large moist dressing of sterile gauze wrung out of ½ per cent. lysol solution is applied (Figs. 260 and 261).

Sensitive patients may require an anæsthetic. Suturing the vagina and cervix are painless, but the patients often object strenuously to the puncture of the skin. Some patients, indeed, are less able to control themselves at this time than during the second stage of labor. Ether or nitrous oxide should be the anæsthetic employed. The relative safety of chloroform

disappears after delivery, the tendency to uterine relaxation and hemorrhage is greater than with ether and, if chloroform has already been used, the likelihood of delayed chloroform poisoning is increased. A competent anæsthetist should be secured, if possible, so that the operator can devote his entire attention to his work.

Two mistakes are almost always made by beginners in this work. The needle is entered too close to the edge of the tear and the sutures are tied too tightly. After delivery the tissues about the vulva become much swollen. This swelling is especially marked in primiparæ, and after long

FIG. 260.—Taking a suture in a tear of the first degree.

labors and operative deliveries, in fact in those cases in which perineorrhaphy is most often required. The two mistakes above mentioned cause the stitches to cut through. If the stitches are tied tightly the swelling of the tissues causes them to cut through, and if the needle is inserted close to the edges of the tear the constricted tissues may be completely severed. Hence the following rule: the needle puncture should be made at some distance one-half inch or more from the edge of the tear, and should be tied just tightly enough to bring the torn margins together but no more. Neglect of these rules is the cause of many failures. As a rule, the needle

should be carried completely around the tear, *i.e.*, it should not appear in the wound. If this is not possible, as is often the case in sewing up tears in the vaginal sulci, the point of the needle should be brought out in the deepest part of the wound, and reëntered near the same point. In this way the formation of pockets is avoided. Whenever the suture is to include anything more than skin and mucous membrane care should be taken to secure a good bite of tissue on either side and thus to bring securely together the separated muscles.

FIG. 261.—Same case. Sutures of silkworm gut. The ends are left long in order to prevent them from pricking the patient.

With these facts in mind let us consider separately the treatment of the more common varieties of laceration.

Excluding mere " nicks " or tears, involving only the skin and mucous membrane, which require only two or three superficial sutures and whose repair needs no special description, there remain for separate consideration three principal varieties.

Tears of the first degree, involving more or less of the perineal body

proper, and causing more or less injury to the muscles that guard the outlet of the vagina.

Tears of the second degree, running up one or the other vaginal sulcus and endangering the integrity of the levator ani muscle.

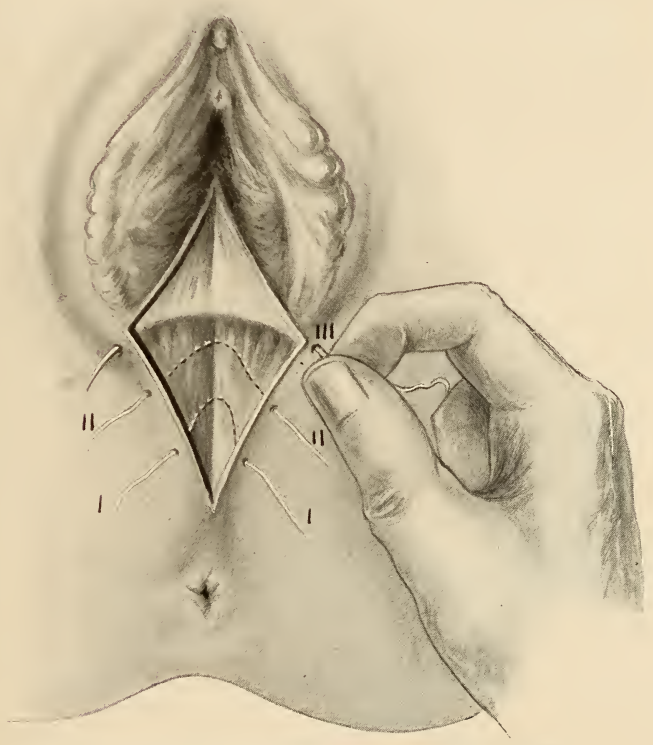


FIG. 262.—Introduction of sutures in a tear of the first degree.

Tears of the third degree, involving the sphincter ani and perhaps the recto-vaginal septum.

TEARS OF THE FIRST DEGREE

Inspection of the parts shows two triangles, a small upper intravaginal triangle, involving usually only the mucous membrane, and a somewhat larger external triangle involving the skin surface and more or less of the perineal body. The vaginal sulci are not involved. The sphincter is untouched. It is an extension of the tear of the fourchette so very common in primiparæ.

It is best closed by two or three sutures from the skin side, as shown

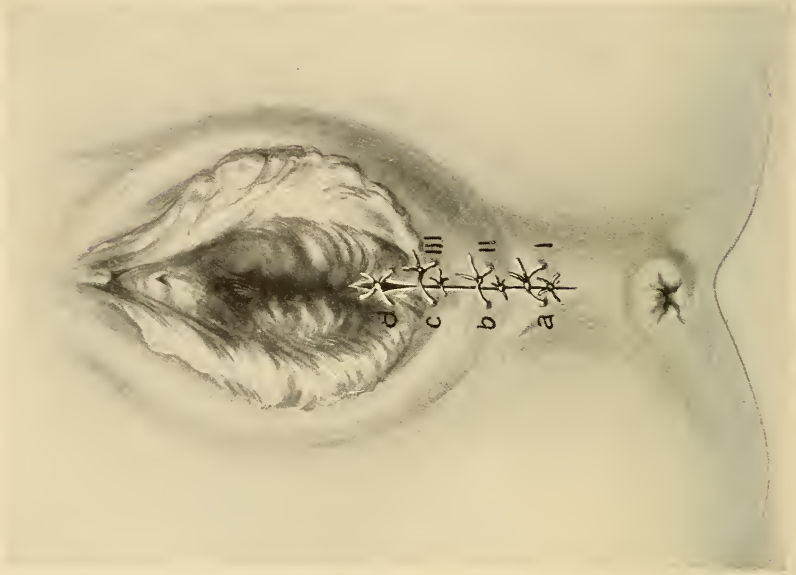


FIG. 264.—Tear of the first degree. Sutures tied.

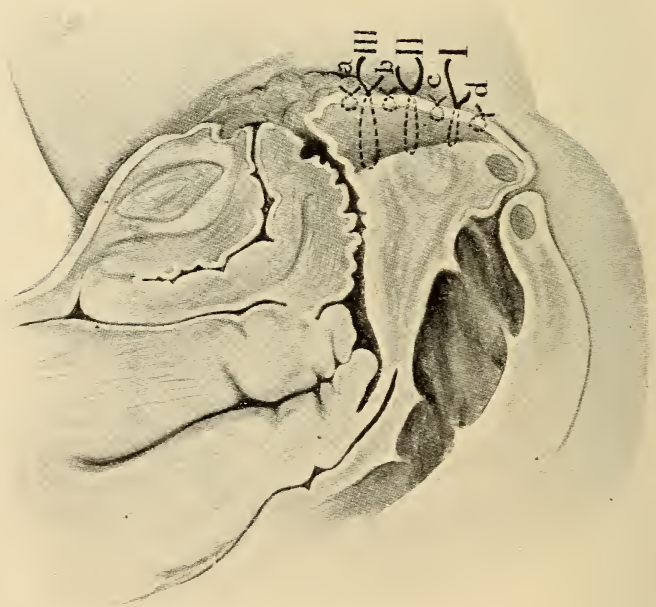


FIG. 263.—Tear of the first degree. Sutures in place.

in Figs. 262, 263, and 264. These sutures should be buried, not appearing in the wound. It will be noticed that suture 3 is so placed as to bring the opposing angles accurately together, thus restoring the parts to their former position. Superficial sutures may be placed as needed. After the closure

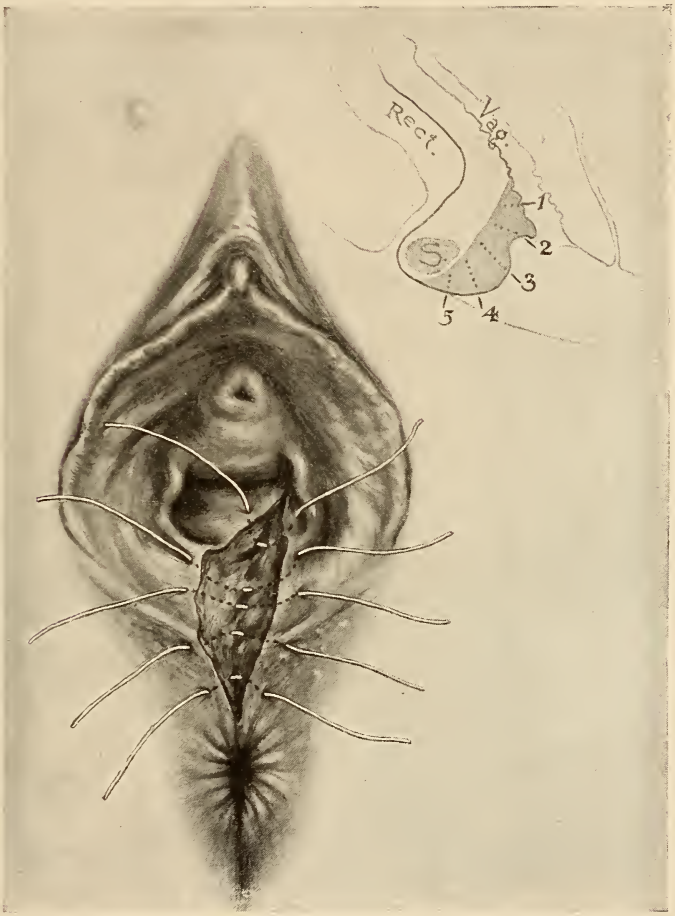


FIG. 265.—Repair of unilateral second degree tear of pelvic floor. (Polak's Manual of Obstetrics, D. Appleton & Co.)

of the perineal tear two or three superficial sutures suffice to unite the tear in the vaginal mucous membrane.

TEARS OF THE SECOND DEGREE

Suppose that the perineal tear is not all, that careful inspection, never to be omitted, discloses a tear running up one or the other vaginal sulcus. Modern gynæcology shows that such tears, dividing as they do the levator ani, have much more to do with subsequent pelvic disability than do tears

that extensively divide the perineal body. If we could repair but one it would be better to repair the tear in the sulcus and leave the tear in the perineum unrepaired. And yet, how often is the perineum repaired and the more serious injury untouched.

These tears must, of course, be sutured from above downward. The first suture is placed near the angle of the wound. If, perchance, the operator does not get his first suture high enough it can be used as a traction handle by which to draw down the tissues and place a second suture where he tried to place the first. Large and strong needles are necessary and the needle should be swept well outward so as to secure a

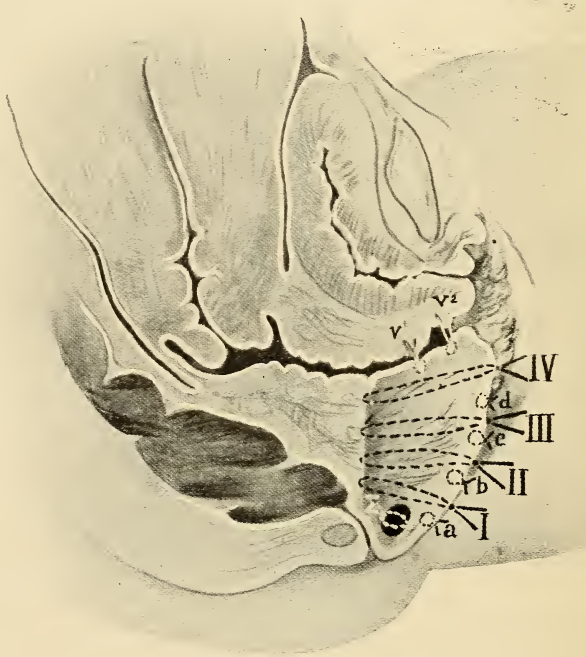


FIG. 266.—Tear involving the sphincter ani. Sutures in place. Σ denotes the buried suture.

good " bite " of the levator ani, whose union is so important to the future welfare of the patient. In these tears there is usually so much tissue to be encircled that it is necessary to bring the needle out in the centre of the wound and reënter it. In doing this the point of the needle should be carried somewhat downward, so that the point of exit is a little lower than the point of entrance and, when reëntered, should be carried upward until it is brought out opposite where it was first entered, as suggested by Howard Kelly. Thus when the sutures are tied the muscular walls of the vagina are lifted upward into their original position. It is impossible to photograph this process, and not easy to describe it, but it is sufficiently illustrated by the accompanying diagrams (Figs. 265 and 266).

Rarely both sulci are torn and it is necessary to repeat the process on the other side. In these cases a tongue of posterior vaginal wall may be separated from its attachments, its lower end hanging loosely in the vagina. In repairing the sulci some of the stitches will of necessity pass through this flap and care should be taken that it remain in its original position. It is safer to leave a small space at its lower end for drainage.

After the closure of a tear in the vaginal sulcus there remains only a tear of the first degree, which should be repaired as already described.

Tears of the Third Degree

These tears should never be neglected. Repair may and should be postponed until the next day if the immediate circumstances are unfavorable, but failure to repair is inexcusable neglect. Some writers state that the operation is very difficult and requires all the paraphernalia of the gynæcologist. *This is a disastrous mistake* and has undoubtedly deterred many a man from attempting repair when he might easily have succeeded. In my experience the operation is less difficult than that for the repair of bad vaginal tears. The whole operative field lies directly under the eye, the denudation has already been done by nature, there is no hemorrhage from any part of the operative field, no more instruments are needed than for an ordinary perineorrhaphy, and with proper technic success is the rule. Experience has taught me that the only really necessary instruments are a needle and needle holder, a scissors, and a thumb forceps or some similar device for "fishing out" the retracted ends of the sphincter. In an emergency one might even dispense with the needle holder. Doubtless the exaggerated idea of the difficulty of the operation arose from the difficulties encountered in the secondary operation performed some months later, an entirely different matter.

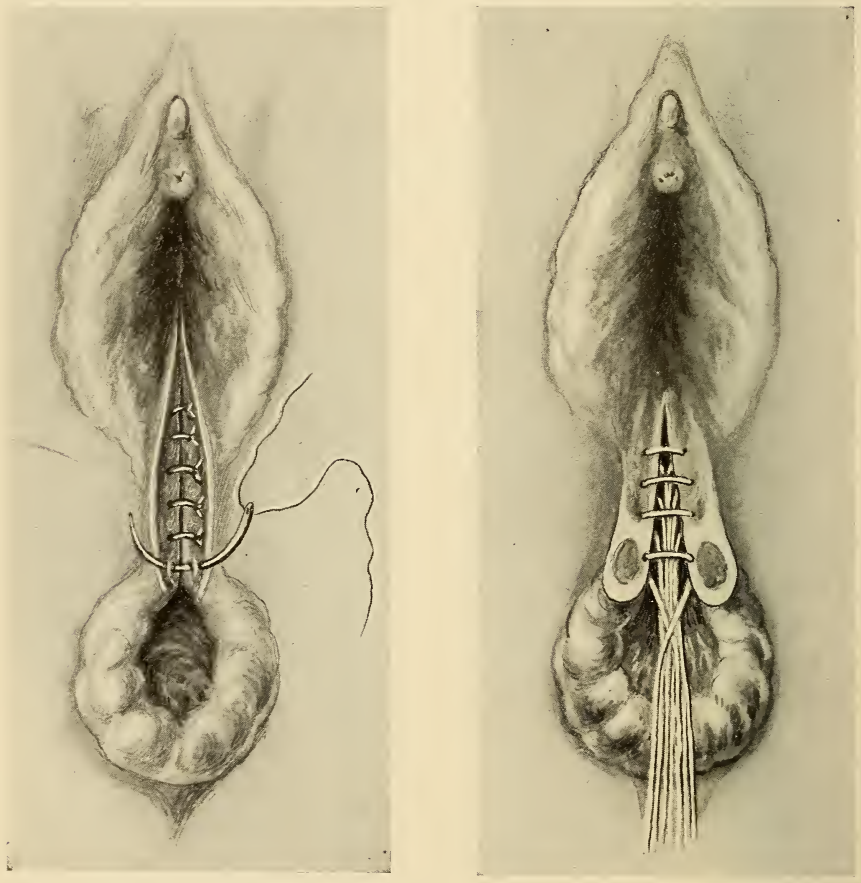
Let the attendant remember that if he only succeeds in bringing the ends of the sphincter ani together and keeping them together he has done his patient an inestimable service.

When the sphincter ani is involved the tear often, though not always, extends to the recto-vaginal septum. If this is the case the tear in the septum is first closed from above downward by interrupted sutures of fine gut, upon a small needle. The usual perineorrhaphy needle is too large for this purpose. Hence a small needle and a roll of fine gut should always form part of the equipment of the accoucheur. The sutures should not enter the rectum but should be tied upon the vaginal side. These, as well as the sutures in the sphincter, will be buried when the operation is complete. To knot the sutures in the rectum and let the ends hang out of the anus, as is often described and illustrated, is to invite sepsis.

The septum being closed the next step and the most important step of the whole operation is the closure of the sphincter. First the fragment of the sphincter is seized and drawn out of the pit into which it has usually

retracted and transfixed by the needle threaded with catgut. The same process is repeated upon the other side, the separated ends are then brought together and the suture is tied. One or more sutures are introduced to reinforce the first. The recto-vaginal septum and sphincter having been repaired the remainder of the tear should be closed by the

FIG. 267. FIG. 268.



FIGS. 267–268.—Repair of the recto-vaginal septum. Fig. 267, correct method; Fig. 268, incorrect method.

methods already described. Care should be taken that the buried sutures in the sphincter are completely covered (Figs. 267 and 268).

Tears of the anterior vaginal wall or of the anterior sulci are not common, but should always be thought of and sought for since they may sever the urogenital trigonum and thus become the cause of cystocele. These injuries are usually on the left side, probably because of the fre-

quency of the L. O. A. position. Among the causes noted are disproportion between the head and soft parts and unskilful efforts at rotation of the posterior occiput with the forceps. The diagnosis is confirmed by palpating the muscle along the pubic bone. The tear should be closed by interrupted sutures, which should be made to secure a firm and sufficient hold of the separated ends of the muscle.

Now and then a large flap of mucous membrane, or even an entire labium minus, may be separated from the underlying tissue, remaining attached along one margin only. In these cases the edges should be re-attached by interrupted sutures of catgut, a space being left at the lower border for drainage.

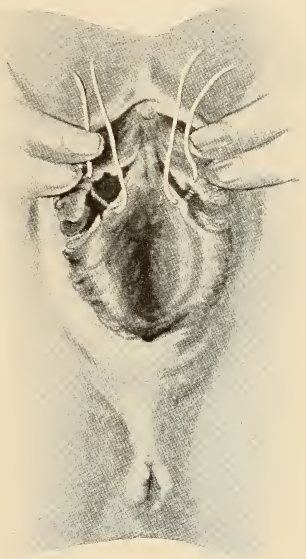


FIG. 269.—Tears in the region of the vestibule.

Atypical and irregular lacerations must be treated upon general principles, but there are certain varieties that require brief mention. Tears in the neighborhood of the clitoris and anterior commissure are rare, but when they do occur may be the source of alarming hemorrhage. Fatal cases have been recorded. This free bleeding is due, as Garrigues has noted, to the fact that the pelvic veins all communicate with each other and are without valves. Prompt and secure hæmostasis is secured by the ligature, and by this alone (Fig. 269).

Management of Bowels.—Before taking up the after-treatment of perineal lacerations in general we should refer to one important point in connection with the repair of those of the third degree—I refer to the subsequent management of the bowels. Many writers, including some eminent gynæcologists, advise that salines be administered on the second day and every day thereafter. However this may be in the case of secondary perineorrhaphy, I believe it to be a mistake in obstetric practice, increasing the danger of infection, requiring unnecessary handling of the parts at a critical time, and subjecting the freshly sutured sphincter to an unnecessary and highly undesirable strain.

My own practice, following the method of Bumm, has been to give food that leaves little fecal residue, *e.g.*, clear soups, broths, or liquid peptonoids, and on the fourth or fifth day a dose of castor oil. I have in some instances waited until the fifth day. Milk and solids should be avoided at this time, as tending to result in the production of hardened fecal masses. An occasional cracker or stalk of celery does no harm.

I have been called upon to perform this operation in hospitals, private houses and tenement houses, in a word, under all kinds of circumstances and conditions, and following the above simple rules my results have been uniformly good. I do not mean, of course, that the result in every case has been perfect; but, with perhaps one or two exceptions, there has been, at least, union of the sphincter and recto-vaginal septum, with control over the bowel movements. Unless the recto-vaginal sphincter has been carefully repaired, and sometimes in spite of this, a recto-vaginal fistula will remain and may persist for some weeks. In my experience, however, no special treatment has been necessary, rest in bed and simple cleanliness, together with the exercise of considerable patience, having been sufficient to effect a cure.

After-treatment of Perineal Lacerations in General.—The patient should be let alone as much as possible. Vaginal douches are unnecessary and probably detrimental. The parts should be kept clean by irrigation but all handling should be forbidden. The use of the catheter should, if possible, be avoided. Inspection of the parts for the purpose of determining whether union is taking place is not to be recommended. The sutures are removed in from eight to ten days. If infection occurs they are, of course, removed earlier. As a rule, however, with reasonable care good results are obtained.

HÆMATOMA

But all lacerations are not visible. Sometimes the mucous membrane remains intact though the vascular structures beneath are torn. In this case the concealed effusion of blood shows itself in the form of a tumor, which is called a hæmatoma (blood tumor). This tumor appears suddenly and takes the form of a diffuse swelling, bluish and congested in appearance and very sensitive to the touch. It is unilateral, involving one side of the vulva, and the adjacent structures. It is said to occur about once in seventeen or eighteen hundred cases, but in my experience the form which we are at present considering occurs somewhat oftener. It appears to be more common after rapid deliveries and especially after rapid forceps deliveries. Sometimes, however, it appears earlier and may even constitute an obstacle to delivery.

There is a form in which the effusion is above the pelvic fascia. It is very rare, indeed, most men never having seen a case. Perhaps it has been an occasional unrecognized, and therefore unreported, cause of death after delivery. The initial swelling is in the upper part of the vagina, but there appears to be hardly any limit to its possible extension. The effused blood may dissect its way beneath the peritoneum as high as the diaphragm, or it may rupture into the peritoneal cavity. The symptoms are those of acute anæmia and of shock, added to the presence of the swelling in the upper part of the vagina.

Treatment.—The ordinary variety of hæmatoma, the vulvar hæmatoma,

is best treated expectantly. Scrupulous external cleanliness is all that is necessary. Handling the parts should be avoided as predisposing to infection. The parts are kept covered with a large pad of sterile cotton, since bruising or abrasion may result in infection. The temptation to interfere should be restrained.

Under this simple treatment the great majority of cases go on to recovery without complications. Should symptoms of infection appear, however, or should the tumor burst and continuous bleeding follow, the tumor should be incised and packed with gauze.

Few have had sufficient experience with the subperitoneal form to be able to draw conclusions with reference to treatment. The conditions are somewhat analogous to those in rupture of the tube in ectopic gestation, and if active hemorrhage is going on the only resource would seem to be to open the abdomen, remove the clots and stop the hemorrhage by compression or ligature.

Tears of the Vagina

Tears of the vagina are, as a rule, simply downward continuations of cervical tears or upward continuations of perineal tears. They are for the most part longitudinal. Perforating tears of the vagina are hardly possible except as the result of inexcusably careless or clumsy work with the forceps. Tears of the upper part of the vagina, however, do sometimes occur quite independently of those of the cervix or perineum and may communicate with the peritoneal cavity. These tears are closely analogous to ruptures of the uterus and like these are usually transverse. They are the result of great distention, as in the case of a large head and a small canal. Sometimes they extend entirely around the upper end of the vagina, separating it completely from the cervix. The older writers called this colporrhexis. The vagina, like the uterus, may undergo pressure necrosis in spots. This is one of the occasional results of delayed labor, especially in cases of contracted pelvis. Vesico-vaginal fistula, formerly so common, is an example of this.

Treatment.—Extensive lacerations of the upper part of the vagina, and of the *cul de sac,* communicating perhaps with the peritoneal cavity, should be treated upon the same general principles as rupture of the uterus. Less extensive tears usually heal spontaneously if conditions are favorable, *i.e.,* if infection does not occur. Suturing in this region is difficult and probably does more harm than good. If the tear communicates with the rectum the resulting fistula should be treated as above described.

Tears of the Cervix

A moderate bilateral tear is, as we have seen, the usual result of labor at term. Its traces are found in almost every woman who has borne a child and need excite neither surprise nor anxiety. More extensive tears, and in particular those which give rise to hemorrhage, should be sutured. The

proposal has recently been made that after every delivery the cervix should be inspected. This is quite unnecessary and would undoubtedly increase the danger of infection. In hospital practice, however, and in private practice whenever conditions are favorable, the cervix should be inspected and if necessary repaired after high and median operations, versions, manual or instrumental dilatation of the cervix, or the induction of abortion or of premature labor.

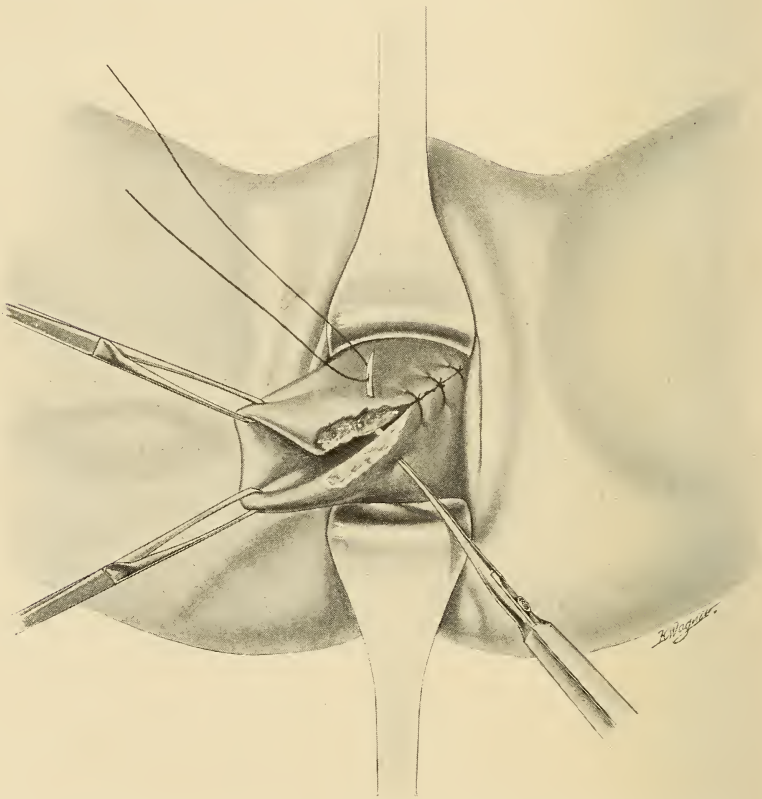


FIG. 270.—Immediate repair of the cervix. It is seldom necessary to use as many stitches as indicated above.

The chief immediate significance of tears of the cervix from a clinical stand-point is their relation to postpartum hemorrhage, and they are fully discussed in connection with that subject (Fig. 270).

RUPTURE OF THE UTERUS (FIGS. 271, 272, AND 273)

Frequency.—This is a rare accident. Averaging the reports of a large number of observers it is found to occur once in about thirty-five hundred cases. Probably it occurs more frequently in private than in hospital

practice, since in the latter there are better facilities for watching the progress of labor and for timely operative interference. It is also probable that traumatic rupture, the result of forced delivery, occurs, both in and out of the hospital, more frequently than is usually supposed.

Varieties.—As regards the method of production there are two varieties, spontaneous and traumatic. As regards its extent there are again two varieties, complete and incomplete. Spontaneous rupture is the result of the forces of nature alone, as in obstructed labor. Traumatic rupture is the result of violence from without, *e.g.,* an ill-timed or unskilfully conducted version.

Character of Injury.—Rupture of the uterus occurring during pregnancy usually involves the body of the uterus since it is, as a rule, the result of a defect in the uterine wall, perhaps the scar of an old operation, or destruction of tissue due to the presence of a tumor. Ruptures occurring

Fig. 271.

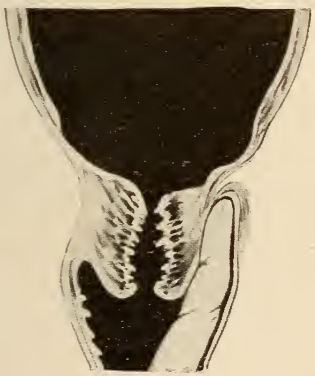


Fig. 272.

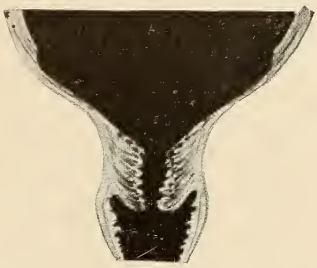


Fig. 271.—Character of the lower uterine segment in a primipara at the eighth month. Progressive thinning of the pericervical region. The finger perceives this at a height of one centimetre.

Fig. 272.—Character of the lower uterine segment in a primipara at term. Pericervical region thin at a height of five centimetres.

during labor, however, are usually the result of pressure and overdistention and, as might be expected, involve for the most part the lower uterine segment, the thinned and distended portion of the uterus which, as we have seen, plays during the greater part of pregnancy such an insignificant part but becomes so prominent during labor. Of the ruptures that occur during labor those that are spontaneous, in other words those that occur without external violence, may be irregular in shape but are usually the result of the extension of a cervical tear, are longitudinal, and often extend into one of the broad ligaments, often with a resulting hæmatoma. In rare instances the tear is circular, the vaginal portion of the cervix being separated from its attachments, literally torn off.

Pressure necrosis of the uterine wall or some portion of the genital tract was formerly common. It was the result of long-continued reciprocal

pressure between the fetal head and some part of the pelvis, *e.g.,* the symphysis pubis. In the latter case the result was a vesico-vaginal fistula, seldom seen under modern methods of treatment. Sometimes the point of contact was with the sacral promontory. This, as may well be imagined, was often the case in pelvic contraction. The perforation was in the posterior uterine wall. Again the point of contact was some exostosis and

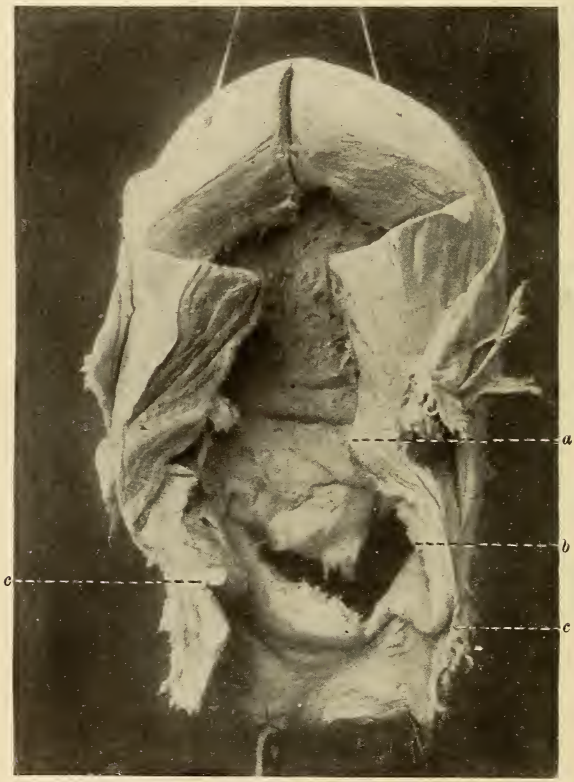


FIG. 273.—Rupture of the anterior wall of the cervix uteri. (Wood's Museum, Bellevue Hospital, No. 1139.) One-third actual size. *a*, contraction ring; *b*, rupture; *c c*, external os.

the perforation might be opposite any point upon the inner surface of the pelvic wall (Fig. 274).

Time of Occurrence.—Rupture of the uterus may occur during pregnancy, but this is very rare, and most observers, even among those of large experience, know of it only by hearsay. Most cases occur after labor has been in progress for some time or, at all events, in the course of some operation designed to hasten delivery.

Etiology.—Two principal causes predominate. Delayed or obstructed labor, and unskilful attempts at delivery. Formerly, when women were

allowed to linger for hours in labor, when the Cæsarean section was attended by a mortality of 50 per cent. or more, and when the forceps operation was considered only as a last resort, rupture of the uterus was naturally more common than now. I fear, however, that traumatic rupture has not decreased very much in frequency. Rapid dilatation of the cervix followed by rapid delivery, as advised by some writers and in some text-books, is sometimes responsible. Rapid extraction in placenta prævia is often responsible. Attempts at forceps delivery or version, practised

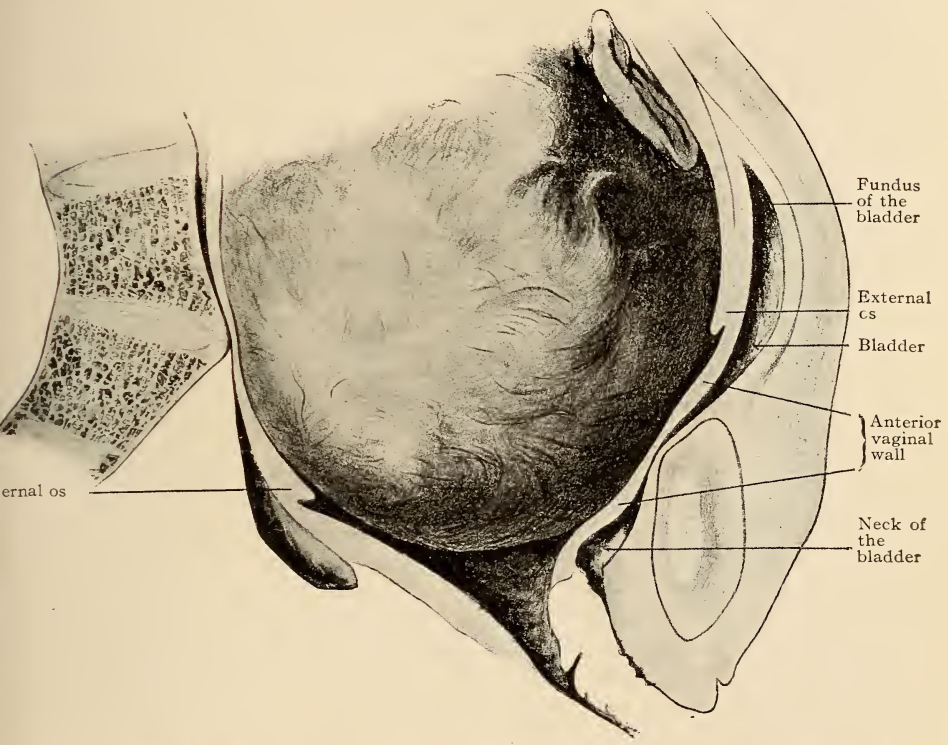


FIG. 274.—Pressure against cervix posteriorly, anterior vaginal wall and neck of bladder, in case of contracted pelvis.

before complete dilatation of the cervix, are fruitful sources of trouble in this respect. Indeed, I believe that every obstetrician of experience sees an occasional death attributed to shock or hemorrhage which is really due to a tear involving the lower uterine segment. More than one such case confirmed by autopsy has fallen under my observation. All these matters are discussed elsewhere, but they are so important that they will bear repetition.

In olden times the improper use of ergot was without doubt an occasional cause of uterine rupture, but now this must be rare indeed. To

make up for this, however, we now have a new etiological factor, the ill-timed employment of pituitrin.

Among the predisposing causes is multiparity. Naturally, the lax and atrophied uterine wall of a woman who has borne many children does not stand the strain of labor as well as it once did. Then, too, in these days of repeated Cæsarean section, such a uterus not very infrequently contains a weak spot in the shape of a long cicatrix. Again such a cicatrix may be the result of efforts to remove an adherent placenta. Tumors may predispose to uterine rupture in two ways, by replacing part of the uterine wall and thus making a "weak spot," or directly blocking the exit of the fœtus and thus indefinitely protracting labor. Pendulous abdomen and other conditions involving faulty uterine axis prolong labor and thus constitute a predisposing cause of rupture. The same thing is true, of course, of abnormalities of the bony canal and especially of pelvic contraction.

In the rare cases in which rupture occurs during early pregnancy the cause is variable. If we except, as we should, cases of tubal pregnancy, rupture occurring during the early months is usually the result of some malformation, as in pregnancy in the rudimentary horn of a bicornate uterus, or it may be traumatic, as in the case of the traditional and much quoted instance of the goring of a pregnant woman. During the later months increasing distention and the painless contraction of pregnancy, which are sometimes quite powerful, may, in the presence of some predisposing cause, produce rupture. In some cases careful examination has failed to reveal the cause.

Mechanism.—If we recall our studies in the physiology and mechanism of normal labor the mechanism involved in uterine rupture at once becomes plain. The reader will recall that the lower uterine segment is the thin, distensible, non-contractile part of the uterus. When for any reason the contractions of the body of the uterus are not able to cause the descent of the fœtus it is easy to see that their only effect can be to increase to an abnormal extent the distention and thinning of the lower segment. This is shown clinically by the fact that the contraction ring, which is nothing more than the raised lower boundary of the body of the uterus, is found at a high level, perhaps as high as the umbilicus, whereas in normal labor it is hardly perceptible and reaches only about to the level of the pelvic brim. In addition to the distention of the lower segment there may, of course, be present some one of the predisposing causes already mentioned. The above, however, is the usual mechanism in spontaneous rupture. It is perfectly obvious that the tendency to rupture is increased when the fœtus is gradually crowded into a transverse position in the lower uterine segment.

Clinical History.—Rupture of the uterus is usually preventable. Though rare, one is as likely to encounter it as another. Indeed, it is especially likely to occur in neglected cases in sparsely settled communities, where medical assistance is not available, or perhaps in the practice of

midwives. Here the physician often finds himself obliged to combat threatening symptoms which have been allowed to develop through no fault of his own.

What are these symptoms? The general symptoms are those of delayed labor already described. The local symptoms are highly characteristic.

Since it is the lower uterine segment that is subjected to the greatest tension the most acute symptoms are referred to the lower abdomen. There is great tenderness in this region. The lightest touch is resented and satisfactory palpation without an anæsthetic is quite impossible. Owing to the thinning of the lower uterine segment and its close application to the fetal body the fetal heart-sounds are heard with startling distinctness. The contraction ring, now very thick and bulky, can be felt, and even plainly seen, as high as the umbilicus and even higher. To the eye the picture resembles that of bladder distention. Above the contraction ring the body of the uterus is found very much thickened and in this region palpation, even with an anæsthetic, is unsatisfactory. The fundus is high and carried far to one side and the round ligaments, stretched to their utmost extent, can be plainly felt and their outlines seen through the abdominal wall. Perhaps some one of the well-known conditions which favor rupture may be recognized—a transverse position of the fœtus, a hydrocephalic head, a contracted brim, or some other cause of delayed labor. The history of labor is one of long and fruitless effort.

Spontaneous rupture usually occurs suddenly and at the height of a contraction. There is a sharp and sudden pain, different in character from those which have gone before. The patient cries out perhaps that something has burst. After this the contractions cease and the pain becomes less severe. The pallor and the weak "running" pulse so characteristic of this accident are not long in making their appearance. Vomiting, a peritoneal reflex, and hemorrhage from the cavity of the uterus are prominent symptoms.

With all this, in a typical case, go the classical and unmistakable symptoms of rupture. The presenting part, usually the head, recedes or even seems for the moment to have disappeared. Coils of intestine may protrude and the hand introduced into the uterus may palpate the rent directly. If, as sometimes happens, the child has passed completely through the rent into the abdominal cavity, the uterus and the child may be recognized as two separate tumors. Perhaps the operator has been in the midst of a difficult version and the sudden lack of resistance may lead him to congratulate himself upon his success. But he is soon undeceived.

However, not all cases are typical. Nor do the symptoms appear so suddenly. Very rarely the head may have descended so far and have become so imprisoned within the pelvis that it cannot recede. Very rarely threatening symptoms may be in abeyance for a time. Hirst records a case in which there were no alarming symptoms until twenty-four hours

after the escape of the child into the abdominal cavity, and another in which abdominal section, a month after delivery, for supposed intra-peritoneal abscess, showed an extensive rent at the fundus, which was being shut off from the general peritoneal cavity by an exudate which was undergoing suppuration.

Traumatic rupture, of course, is not necessarily preceded by these symptoms though it may follow an attempt at their relief. In most cases of traumatic rupture the symptoms are those of the condition for which the operation is undertaken—perhaps eclampsia or placenta prævia. The symptoms of rupture do not appear until after some operation and are then often unrecognized. They are essentially those of hemorrhage and shock, but the hemorrhage does not come from the cavity of the uterus. There is probably more or less laceration of the cervix but the symptoms are more threatening than would be expected from the visible loss of blood and the shock more severe than circumstances seem to warrant. In these cases there is usually a laceration of the cervix, which proves to be greater than was at first supposed. Sometimes the operator even imagines that it has been satisfactorily repaired.

Diagnosis.—About the only obstetric accident which is likely to be mistaken for rupture of the uterus is accidental hemorrhage. Here the evidences of acute anæmia and of shock coming on suddenly during pregnancy or labor remind one strongly of rupture of the uterus. There is, however, no recession of the presenting part and, in the concealed form, which is really the worst form, there is, of course, no visible hemorrhage. Moreover, rupture of the uterus usually occurs late in labor and is preceded by the classical symptoms of delayed labor.

Difficulty may arise in determining the character and extent of the rupture and particularly whether it is complete or incomplete. Garrigues has noted that the abdominal viscera can be felt so plainly through the thin and delicate peritoneum that it may be impossible to tell whether this membrane is still intact or not. In case of doubt it might be well to adopt the suggestion of Polak and make a digital exploration through an incision in the posterior *cul de sac*.

Prognosis.—This is always serious. In former times, before the development of modern antiseptic methods, 90 per cent. of the mothers were lost and even now, under the best methods, maternal mortality is probably not less than 50 per cent. Most of the children are lost, some from the delayed labor and futile attempts at delivery, others by the death or very serious general condition of the mother, and still others by the fact that the rupture may involve the placental site and thus interfere directly with the exchange between mother and fœtus. In some cases the placenta is completely detached.

Prophylactic Treatment.—This is of paramount importance. It is far easier to prevent rupture of the uterus than to remedy its consequences. With the exception of those very rare cases in which the uterine wall has

been weakened by tumor formation or operative cicatrices, rupture of the uterus should not occur; *i.e.,* of course, in cases which have been under medical supervision from the beginning of labor. The attendant should never forget to look for the premonitory signs in every case of delayed labor. It is a tragic mistake to wait until these signs are forced upon one's attention. It will not do to assume that, because a condition is rare, it will not be met with in general practice. Indeed, such an accident as this is more likely to occur in neglected cases in far off localities than in hospitals.

Cases of delayed labor should not be neglected. Malpositions, especially shoulder presentations, should be corrected before it is too late. In these days of repeated Cæsarean sections a patient with a uterine cicatrix should not be allowed to linger too long in labor. In the rare cases in which a patient who has already survived one rupture of the uterus becomes pregnant again, the Cæsarean section should be performed early in labor.

Such anomalies as hydrocephalus and face presentation should be recognized early in labor. Here the importance of a good knowledge of external palpation is manifest. A thorough training in the external diagnosis of pregnancy and labor would have saved many a uterus from rupture.

The technic of the various operations for delivery is described elsewhere and it is quite unnecessary to tell any intelligent student or practitioner that, in the presence of symptoms threatening uterine rupture, delivery should be accomplished as soon as practicable, or that he should study carefully the subject of delayed labor and the technic of obstetric operations intended to bring about delivery.

It is worth our while to mention one or two points which are usually neglected.

Delivery by the forceps through a partly dilated cervix should not be undertaken. If such delivery is indicated the cervix should first be dilated by other means. Except in cases of placenta prævia or dead fœtus the same rule holds in the operation of version. It is by violations of this rule that the worst cervical tears are produced, tears that may extend far up into the lower uterine segment and are beyond the possibility of repair through the vagina. My own experience leads me to believe that careful substitution of the axis-traction forceps for the older instrument in all high and most median operations will do much to diminish the frequency of cervical tears and indirectly of tears of the lower uterine segment.

The so-called accouchement force, *i.e.,* the rapid and forcible dilatation of the cervix before the disappearance of its canal, followed by a forced delivery, should be tabooed as far more dangerous than any complication which it is intended to cure.

If craniotomy is performed in the presence of a much distended lower uterine segment, traction upon the head in order to fix it at the brim should as far as possible be dispensed with. This is a useful observation of Carl Braun.

The oxytocics, ergot and pituitrin, both valuable when indicated, are to be used with discretion. Speaking generally we may formulate the two following rules:

Ergot should not be given until the placenta has been delivered.

Pituitrin should not be given unless the cervix is completely, or almost completely, dilated, and there is no serious mechanical obstacle to delivery.

These rules are not absolute, as we have already seen. There are occasional exceptions to the first rule and to the first part of the second.

Curative Treatment.—If the fœtus has escaped into the abdominal cavity, or if it has so far escaped that its withdrawal would be difficult or would probably increase the extent of the laceration, it should be promptly removed through an abdominal incision, and the same procedure should be followed if the head is above the brim or the pelvis contracted or the cervix hard and undilatable. Much manipulation in these cases is highly dangerous and there is no doubt that manual dilatation or any except an easy operative delivery would in the presence of uterine rupture involve a greater risk than the removal of the child by laparotomy.

In cases like the above the course to be pursued is plain. The attendant has a serious duty to perform, but at all events he is relieved from the anxious responsibility of choosing between two radically different courses in a critical emergency.

But suppose that the child is easily extracted, the bleeding only moderate, and the patient in fairly good condition. What is to be done? Two courses are advocated and practised. One is to tampon the uterus and vagina with gauze, apply an ice-bag externally, give morphine or pantopon hypodermically, and keep the patient perfectly quiet: the same treatment, practically, with the exception of the tampon, that would be employed in accidental perforation of the uterus during curettage. And, indeed, even in uterine rupture, it is better to omit the tampon if the bleeding is slight or absent and when it is used to be careful, by inserting the first meshes of gauze rather loosely, that the rent is not increased or the bleeding started afresh.

Other authorities advise laparotomy in all cases, citing the undoubted facts that hemorrhage that has ceased may recommence and that a large subperitoneal hæmatoma may gradually form in cases that are apparently pursuing a favorable course.

Statistics are obviously unreliable, and few men have had sufficient personal experience for a well-grounded personal opinion. Those who have had the most experience, *e.g.,* Scipiades of Budapest, who has a record of nearly one hundred cases, and various other observers in the continental clinics where, owing probably to two factors, the greatest frequency of pelvic contraction and the very common employment of midwives, the accident has been far more common than in America, are in favor of the first method. Doubtless, as the technic and results of the more radical operation continue to improve it will be more frequently used but it

is not likely to supersede the other in general practice. If the operator is in doubt the facilities for good surgical work and the experience of the operator will be the deciding factors.

If the uterus is not to be removed, the edges of the peritoneal tear are to be carefully brought together in the manner already described in connection with the Cæsarean section, and the wound drained through the vagina. If infection is deemed probable, or if the nature and extent of the wound demand, the uterus is removed. The supravaginal method is to be preferred as much easier and involving less risk, but in some cases the extent of the wound downward may necessitate total hysterectomy. The removal of the uterus postpartum is easier than its removal under ordinary circumstances, but the fact that, in this case, it must be performed upon a patient already profoundly shocked or perhaps almost *in extremis* does not add to the composure of the operator.

Laparotomy for ruptured uterus is, of course, a hazardous undertaking, but in the cases in which it is clearly indicated it offers the only chance for the patient. This fact should be explained to her family.

Ether or nitrous oxide should be the anæsthetic and saline infusion or other restorative measures should be practised while the patient is still upon the table. Jeannin advises that the abdominal surface be simply painted with iodine, all washing and brushing being sedulously avoided. Such procedures may result not only in increasing the bleeding but in massaging the uterine contents through the uterine rent into the peritoneal cavity.

Unnecessary movement in these cases is highly dangerous. Transportation from the patient's residence to a hospital has proven fatal and even the transfer of the patient from the bed to the operating table should be conducted with the greatest possible care.

Inversion of the Uterus

This accident, somewhat akin to rupture of the uterus, is perhaps best considered here. The term explains itself. The uterus is turned either partly or wholly wrong side out—partial or complete inversion. Of course this cannot happen without some rupture or tearing of the uterine attachments, though the uterus itself remains intact (Fig. 275).

Inversion of the uterus is one of the rarest of obstetrical accidents; so rare indeed that it is difficult to estimate its frequency. Whitridge Williams tells us that not a single case occurred in two hundred and fifty thousand labors in the St. Petersburg Lying-in Hospital, and but one in two hundred thousand cases in the great maternity hospital of Dublin. Under these circumstances, it is not strange that few, even among those especially interested in obstetrics, have had the opportunity of studying the condition clinically.

Inversion may be spontaneous or traumatic. That is, it may be produced by intrinsic causes or by interference from without. An example

of the first class would be uterine relaxation, one of the second pulling on the cord.

Artificial causes are by far the more frequent.

Inversion of the uterus is much less common than formerly. This is due to the fact that the management of the third stage of labor is better understood. It was formerly the custom to endeavor to dislodge the placenta while it is still *in utero* by pulling upon the cord. When this was combined with pressure upon the fundus, in the case of a relaxed uterus and a placenta attached at the fundus, the conditions for producing inversion would seem to be almost ideal. And yet, even when all this was the custom, inversion was a rarity. In a case which I saw with Dr. Charles P. Duffy the immediate cause seemed to be straining during

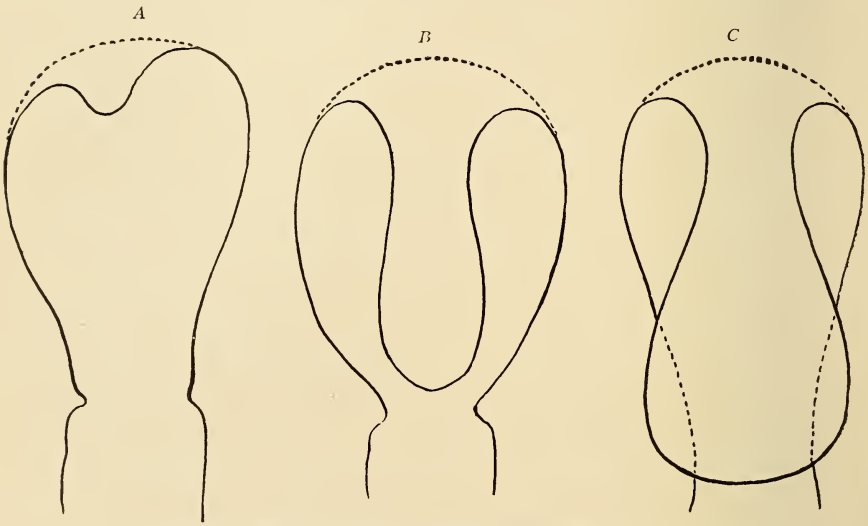


FIG. 275.—Inversion of uterus. *A*, beginning; *B*, partial; *C*, complete.

defecation, the patient being in the sitting posture. Of course, a well contracted uterus cannot become inverted. As Bumm says, such a uterus cannot be inverted artificially; not even by the use of force. Relaxation of the uterus, or, at all events, relaxation of the fundus, is a necessary condition. Sometimes contraction of the lower uterine segment appears to grasp and draw down an indented and flabby portion of the fundus.

Symptoms and Diagnosis.—The symptoms are sudden, acute, and highly threatening. Severe, sudden and tearing pain is followed immediately by hemorrhage and profound shock. The attendant thinks perhaps of rupture of the uterus, but examination shows him his error at once. The hand laid upon the uterus shows that the uterus is wholly or in large part absent from the abdominal cavity. Internal examination recognizes a tumor in the vagina or sometimes just within the cervix—the inverted

fundus. In cases of complete inversion the fundus is seen protruding from the vagina, a bloody tumor covered with mucous membrane and often with the placenta attached.

It would seem that there should be no difficulty in making a diagnosis of inversion, but among the curiosities of obstetrical literature is to be found the report of a case in which the inverted uterus was mistaken for the head of a second twin and the forceps were applied. In another it was mistaken for a polypus and ligated. We smile at such errors, but they may happen to any man who neglects careful bimanual examination. Just as in making the diagnosis of breech presentation it is not the presence of the breech at the pelvic brim, but the absence of the head that gives us

FIG. 276.—Urethra dilated for introduction of finger into the bladder.

our clue, so here it is not so much the presence of a foreign body in the cervix as the absence of the body of the uterus from its normal position that makes the diagnosis positive.

Prognosis.—The prognosis is always very grave. It is usually estimated as about 30 per cent. The chief dangers are hemorrhage and shock, the latter being often attributed to the sudden diminution of the intra-abdominal pressure. To my mind a better explanation is to be found in considering the peritoneal investment and attachments of the uterus. In the case referred to above the patient was but four months pregnant and the size of her uterus would hardly be sufficient to make much difference in the intra-abdominal pressure. Indeed the obstetrician, who so often sees the rapid subsidence of enormous abdominal distention, *e.g.*, in hydramnion

and twin pregnancy, and, above all, in the Cæsarean section, is apt to become sceptical as to the importance of this factor, upon which it is customary to lay so much stress.

Treatment.—No one man has had sufficient experience to justify him in speaking with authority. Of course, the patient is often found in a state of profound shock and one hesitates to operate immediately. Doubtless it is better in some cases to wait. In the case of which I have spoken above I was forced to desist, after having partially reduced the inversion, my anæsthetist fearing to continue the anæsthesia. The patient rallied, however, and the reduction was completed a few days later. In another case I was called by Dr. George Stevenson on account of profound collapse. This patient was a primipara, sixteen years of age, weighing 165 pounds; labor was of short duration and characterized by unusually severe pains. The inversion occurred immediately on delivery of the placenta, the fundus protruding slightly beyond the vulva. The uterus was replaced and packed with gauze. The patient made a good recovery.

Under ether anæsthesia one hand, shaped in conical form, is passed into the vagina seeking by upward pressure to return the uterus to the abdominal cavity, while the external hand guides and controls the movements of the internal. It is best, if possible, to indent the uterus in the neighborhood of one of the Fallopian tubes and then of the other before attempting to reinvert the centre of the mass. This is the method of Nöggerath and represents an effort to follow the direction of the muscular fibres of the submucous layer (Fig. 276). Another method is to grasp the neck or highest part of the constricted fundus, reducing this first and later the succeeding portions of the mass from above downward. Sometimes direct pressure upon the mass works best. These methods may be tried in succession. Meanwhile an attempt may be made to dilate the opening through which the fundus has passed by the fingers of the external hand. Of course, the pressure should be made in the axis of the superior strait, or it will be injurious rather than helpful. If the placenta remains attached to the fundus it is better not to remove it, since the usual mechanism for the prevention of hemorrhage is not operative and profuse bleeding may result.

In irreducible cases with persistent bleeding hysterectomy has been suggested, but anterior vaginal hysterotomy followed by reduction of the inversion and packing of the uterus would be more conservative and equally effectual. The patient is apt to be a bad subject for major surgery.

Preventive Treatment.—This is at once suggested by the etiology of the condition. Under no circumstances should any traction upon the cord be permitted while the placenta remains in the uterus. Misdirected haste and undue pressure in premature attempts to remove the placenta should be avoided. Uterine relaxation during the third stage should be avoided by the methods already described. Straining at stool, while in the sitting position, should be avoided.

CHAPTER XXII

THE PUERPERAL HEMORRHAGES

This term is often applied in a general way to the hemorrhages of pregnancy, labor, and the puerperium. There is more bleeding during the puerperium than at other times, and it is probably for this reason that the term "puerperal" is used. Like many other terms, it is convenient rather than strictly correct.

These hemorrhages may be divided in a general way into: 1. Antepartum hemorrhages, which include placenta prævia, and separation of the normally implanted placenta (accidental hemorrhages), and, 2. Postpartum hemorrhage, of which there are several varieties.

Let us first consider the latter; the most common of the different forms of hemorrhage with which the obstetrician has to deal.

Postpartum Hemorrhage

Definition.—The term postpartum hemorrhage is applied to hemorrhage from some portion of the genital tract after delivery, as distinguished from antepartum hemorrhage, or hemorrhage before delivery.

In its restricted and colloquial sense, the term postpartum hemorrhage means hemorrhage from the placental site, following delivery immediately, or within an hour or two. In its broader sense, the term includes hemorrhage from the cervix, vagina, and vulva, as well as the so-called "late hemorrhages" that may occur hours, or even days, after delivery.

Frequency.—It is impossible to estimate the frequency of postpartum hemorrhage. It varies with the character and attendant circumstances of labor, and, above all, with the skill of the attendant. I am accustomed to say to my students that the frequency with which a man meets this complication is a fairly good index of his ability as an accoucheur. To this rule, however, as to most others, there are occasional exceptions. In rare instances severe hemorrhage may occur after a labor that has been managed *lege artis,* and has apparently pursued a perfectly normal course. As we shall presently see, it is much less common than formerly, and it is less common in hospital than in private practice.

Etiology.—Of course the immediate cause in all cases is the failure of the uterus to contract and retract, thus compressing the sinuses at the placental site. Hence it is easy to make out a long list of supposed causes or conditions which from a theoretical stand-point might interfere with uterine contraction, *e.g.,* anæmia, debility from any cause, various general diseases, and many local affections, *e.g.,* tumors, inflammations, adhesions, etc. As a matter of fact one usually sees good contraction in anæmic and debilitated subjects, and if labor is properly managed severe bleeding is

of the rarest occurrence. Hence it would seem that many writers in discussing the etiology of hemorrhage have been governed by theoretical considerations rather than by the results of direct observation.

Long observation has convinced me that most cases of hemorrhage are due to:

1. Prolonged or precipitate labor; 2. Improper management of the third stage; 3. Excessive or improper use of anæsthetics, especially chloroform.

Of these three causes the last two are most in evidence at the present time. In former years, when women were allowed to linger for hours, or even for days, in the second stage of labor, hemorrhage was a common occurrence. The exhausted uterine muscle could no longer serve as a safeguard against the dreaded accident, and the mind of every practitioner was filled with apprehension. Since we have learned to terminate labor before exhaustion supervenes, serious hemorrhage is far less common.

Strange though it may seem at first thought, too rapid delivery may also be the cause of hemorrhage, whether the delivery is natural, as in precipitate labor, or artificial, as in a too rapid forceps delivery. In these cases there is no time for uterine retraction, the fundus does not follow the breech during the period of expulsion, and a large cavity is left at the fundus which rapidly fills with blood; and this even before the birth of the child.

A very common cause of hemorrhage is improper management of the third stage, and especially the premature use of Credé's method, or of other methods of placental expulsion. This subject is discussed in connection with the management of the third stage of labor, which the student is advised to read carefully.

During the period immediately following delivery nature usually allows the tired uterus a period of rest; the "period of physiological repose" of the French writers. At this time contractions are not normally present. A moment's reflection is sufficient to show that anything which tends to favor the detachment of the placenta at this time may cause hemorrhage.

Other causes which have been adduced as favoring hemorrhage by causing too early placental detachment are shortness of the cord (and the cord may be relatively short if it is twisted two or three times around the child's neck), accidental seizure of the placenta by a forceps blade, intra-uterine manipulations during version, and late rupture of the membranes.

A common cause of hemorrhage nowadays is chloroform anæsthesia, especially when prolonged or profound, as in operative deliveries. This subject is discussed in the section on the technic of obstetric operations.

But it is not solely in obstetric surgery that this danger exists. More or less uterine relaxation often follows the use of chloroform when employed simply to alleviate suffering. I have observed this too often to be deceived. Many men give more than is necessary, give it by drachms

rather than by drops, give it during the intervals when they should give it only during the contractions. Ether has less tendency to produce relaxation and with this agent in drop doses the maximum of safety is reached.

All this does not mean that we should forget the humanitarian side of our work and allow our patients to suffer unnecessarily, but only that we should not permit familiarity with anæsthesia to breed carelessness.

Among the rarer causes of hemorrhage are pelvic adhesions, and fibromatous degeneration of the uterine wall. Theoretically it would seem that these causes should produce bleeding much oftener than is really the case.

Physical shock or sudden effort, *e.g.,* coughing, sneezing, or straining at stool, may now and then result in hemorrhage, perhaps by dislodging coagula at the placental site. I recall a case in which a recently delivered patient sustained a severe hemorrhage as the result of sitting up in bed shortly after delivery, contrary to my express instructions.

That a distended bladder may prevent uterine contraction is known to every one and this is just as true after labor as before. During labor a full bladder causes delay in delivery. After labor it causes hemorrhage.

Somewhat analogous to the hemorrhage due to the uterine exhaustion of delayed labor is that which follows twin labor, or labor complicated by hydramnion. In these cases the uterine muscle has been weakened by long months of overdistention, by the ineffectual contractions of the latter weeks of pregnancy, and by the prolonged first stage so common in these cases.

And finally, let the reader never forget that now and then a severe hemorrhage may occur when, as far as can be ascertained, none of these causes are present, and after a labor apparently in all respects normal. I well recall one occasion when, in the small hours of the morning, I was obliged to pack the uterus after an easy labor presenting no unusual features whatever.

Bumm has suggested that in cases like this the deficiency in contraction is due to some congenital defect in the uterine musculature. However this may be, such incidents serve to remind the accoucheur that he should never be off his guard.

Diagnosis.—A moderate blood loss, estimated at from 80 to 100 grammes, is a necessary part of every labor. The man who carefully watches a few normal labors will soon learn to recognize any deviation from the usual flow. If he is in doubt, the hand at the fundus will settle the question. If the uterus is well contracted and hemorrhage continues, the bleeding is probably from the cervix, although if the case has been one of placenta prævia, it may be from the lower, non-contractile, uterine segment. These varieties of hemorrhage will be discussed later.

But the attendant must know how to recognize good uterine contraction. I have seen some nurses, and now and then even a physician, who appeared to think that if one can feel the uterus at all it is contracted.

In rare instances there may be grave hemorrhage with no flow of blood externally. This condition is known as concealed postpartum hemorrhage. I recall the case of a recently delivered woman who seemed to be doing well after the completion of the third stage of a normal labor. For some reason she was left for a few minutes alone, both by the nurse and myself. Returning to the bedside I was struck by the pallor of her face. The pulse also denoted extreme weakness. Inspection showed no bleeding, but pressure over the fundus resulted in the expulsion of an enormous quantity of blood and clots. It is hardly necessary to say that the patient was carefully watched for a few days. Fortunately she made a good recovery. The lesson to be drawn is plain. Cases like this are rare but the possibility of their occurrence should not be forgotten.

Treatment.—The prophylactic treatment is by all odds the most important. Postpartum hemorrhage is usually preventable. In its severe forms it seldom occurs in well regulated hospitals or in the practice of careful men.

A review of the causes at once suggests the proper measures of prevention. The patient should not be allowed to linger in labor until she is exhausted. Precipitate labor should be restrained by suitable measures, described elsewhere. Forceps delivery should not be too rapid and during the expulsive stage the fundus should be carefully followed by the hand of an assistant. It is the custom with many physicians to give ergot as a routine measure as soon as the placenta has been delivered. Some have objected to this, but I believe it to be a wise custom. It does no harm and may save a life now and then. If there exist any predisposition to hemorrhage, *e.g.,* if the patient has been delivered of twins or if she has had much chloroform, the ergot should be given hypodermatically. It should also be given in this manner if she has a delicate stomach or if there is nausea or vomiting. The patient should be kept under observation for at least an hour after the expulsion of the placenta; in suspicious cases, two hours. All these subjects are discussed elsewhere and need not be reconsidered here. The student is advised to review them in connection with this subject. To know how to prevent hemorrhage means to understand the management of labor as well as the technic of the ordinary obstetric operations, and of obstetric anæsthesia. But it is well worth while.

Curative Treatment.—Since we can never know in advance that hemorrhage will not occur we should always have at hand those means that experience has shown to be absolutely necessary for its arrest. These necessities are few in number, and to be without any one of them should be regarded as a serious error.

They include plenty of hot sterile water, a fountain syringe, clean and new, an intra-uterine douche tube, a preparation of ergot suitable for hypodermic use, together with a hypodermic syringe that has recently been tested, and sterile gauze bandages four inches wide for packing the uterus.

To these should be added a volsellum forceps, or better two, a needle holder and needles, all of which are indispensable in case of hemorrhage from the cervix, and a needle for hypodermoclysis or venous infusion. Rubber gloves for intra-uterine manipulations should never be forgotten.

Many expedients more or less efficacious have been used and advised, but in the presence of hemorrhage there is little time for deliberation or choice. It is, therefore, best for the attendant to choose those which have best stood the test of experience, and to waste no time in their application. It is also advisable that a certain order should be preserved and followed in every case. This order should be rehearsed, memorized, and followed, until the attendant cannot forget it if he will. Bad results are usually due, not to incompetence or to the lack of curative means, but to indecision or hesitation in their application.

I am accustomed to formulate the treatment of postpartum hemorrhage as follows:

1. Massage of the uterus and expression, or if necessary manual removal, of the placenta and other uterine contents. While the physician is thus employed the nurse should lose no time in giving a hypodermic injection of some suitable preparation of ergot. A syringe filled with ergot and ready for immediate use should always be at hand.

2. If the above fails, intra-uterine injection of hot salt solution.

3. If uterus fails to contract and hemorrhage continues, thorough tamponade of uterus and vagina.

As we have already seen, the uterus should be carefully watched for at least an hour after delivery. If hemorrhage occurs, the relaxed uterus should be vigorously massaged, and as soon as contraction has been secured the uterus should be emptied of its contents by simple pressure upon the fundus or, if necessary, by the method of Credé. Let the reader remember as the first principle of treatment that before the hemorrhage can be checked firm uterine contraction must be secured. This can only be accomplished by emptying the uterus completely. If the uterus contains only clots, or if the placenta is completely detached, simple pressure over the fundus may be sufficient. If, however, the placenta is still *in utero* and there is any delay in its expulsion, it should be at once expressed by the method of Credé. Every one who takes the responsibility of caring for a woman in labor should learn this method, if only to use it in cases of hemorrhage. Its great advantage is that it enables the attendant to empty the uterus promptly if emergency demands, and this without the introduction of the hand and consequent risk of infection. My observation is that many men have not learned the technic of this simple manœuvre, and therefore lose much time or fail altogether. In the hands of one who knows how to use it Credé's method will seldom fail, but in the rare cases in which it does fail it is not wise, if hemorrhage continues, to waste time in prolonged efforts. Under these circumstances the gloved hand should be introduced and the placenta removed. Gloves should be worn in all these cases, but

they are especially useful when hemorrhage is profuse and time for disinfection of the hands is lacking. While these things are being done the nurse should lose no time in administering a hypodermic injection of some suitable preparation of ergot. If no competent nurse is present the physician can give the injection of ergot with one hand, while he holds the fundus with the other. In these cases the subcutaneous use of ergot is the only rational one. Its use by the mouth is apt to nauseate the patient. Women who have lost much blood are especially prone to vomiting. Moreover, time is precious, and the hypodermic method is much more prompt and efficient.

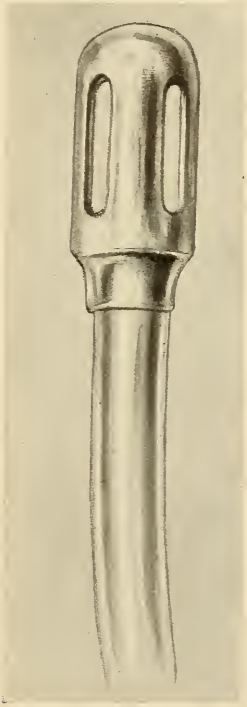


FIG. 277. — Intra-uterine douche-tube, natural size.

Firm massage of the empty uterus usually secures good contraction. If, however, this is not the case, the physician proceeds at once to the next step—the intra-uterine injection of hot sterile water. The fountain syringe, already filled, hangs in a convenient place, and the douche-tube has been sterilized with the other instruments and accessories. The tube is carried into the vagina under the guidance of the finger, and the operator should make sure that the tip passes through the internal os. It is unnecessary and dangerous, however, to pass it to the fundus, as is sometimes advised. The effect is no greater, and there is danger of injecting fluid, or washing clots, into the uterine sinuses. The best tube is of glass, about as large as the finger, perforated at the sides, but not at the end, which should have a bulb-like enlargement. Such a tube can be easily felt through the abdominal wall, and is not likely to penetrate the uterine wall, or enter a sinus. Small metal tubes are obviously unsuitable (Fig. 277). The solution should be in the neighborhood of 120°, *i.e.,* about as hot as will permit the immersion of the hand for a minute or two.

There are few cases in which the emptying of the uterus, followed by a hot douche, fails to arrest the hemorrhage. In these cases the uterus should be tamponed. The most convenient material for this purpose is a sterilized gauze bandage four inches wide. A few such bandages should always be a part of the equipment of the obstetrician. The tamponade may be either manual or instrumental. In the latter months of pregnancy and at term the manual method is much more satisfactory and thorough. At this time the cervix can be pushed down to the vulva and the gauze introduced with two fingers. In the manual method, assistants and instruments are not necessary and time is saved, a matter of vast importance.

In hemorrhage after abortions the instrumental method may suffice. In the latter months of pregnancy and at term, the manual method is the only method which can be relied upon. Working in a cavity so large as the full-term uterus, the hand or half-hand is much more satisfactory, since the sense of touch enables the operator to tell just where to place the gauze. Many a nook and corner must of necessity be neglected if only the dressing forceps are used. The external hand at the fundus guides and controls

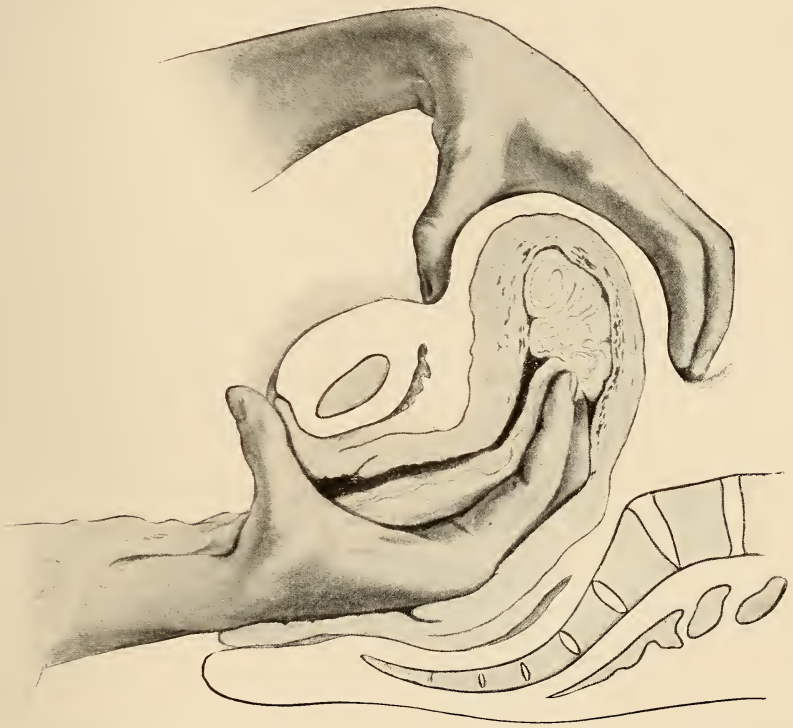


Fig. 278.—Uterus tamponed by the manual method.

the internal one, and thus the operator has at all times perfect and efficient knowledge of what is going on within. Merely to push a few pieces of gauze into such a cavity with a long dressing forceps is to invite failure.

The secret of the control of postpartum hemorrhage is to thoroughly tampon the uterine cavity by the manual method before it is too late. As a rule the procedure is not very painful, but if the patient is highly nervous and sensitive a few drops of ether may be given. Theoretical objections have no weight with those who know from experience what this method will do. It is astonishing that for so many centuries women were allowed to bleed to death before Dührssen conceived the idea of applying to this emergency the ordinary rules of surgery.

The accompanying illustration (Fig. 278) shows better than words can tell just how to pack the uterus. The great essential is that the first piece of gauze should be carried to the fundus. After the uterine cavity is fairly well filled additional gauze should be carried up in front, behind, and on both sides of the central mass until the limit has been reached. All this time the external hand makes firm counter-pressure. It is my observation that the failure of some men to attain success with this procedure is due to the fact that they do not pack with sufficient thoroughness. When the uterine cavity has been filled, the vagina should be packed and a T-bandage applied. If the packing has been properly done, the uterus soon attains a stony hardness. There is no uterine hardness like that of a tamponed uterus except in the case of the so-called accidental hemorrhage when the antepartum uterus is filled with blood that cannot escape. The packing should be slowly and carefully withdrawn at the end of from twelve to eighteen hours. I have never known the bleeding to recur, nor do I believe that it will recur, if the work has been properly done.

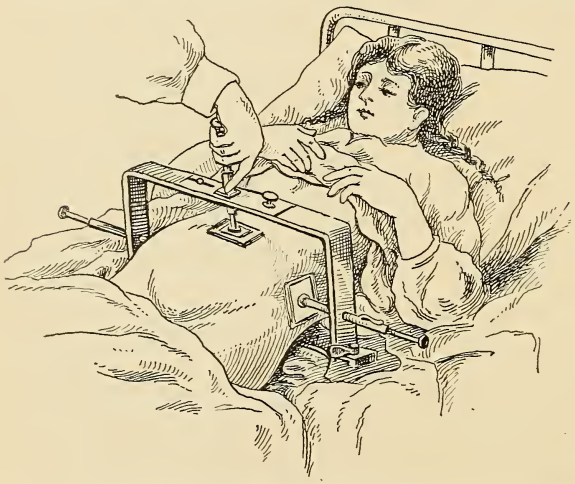


Fig. 279.—Instrumental compression of the abdominal aorta (Gauss).

A method recently devised by Momburg is the constriction of the upper abdomen by a piece of rubber tubing. The constricting tube is tightened until the pulse in the femoral artery disappears. That this method cannot be entirely without risk seems plain. That it cannot often be necessary is equally plain. I do not think the method will survive.

A better way of compressing the abdominal aorta is that of Gauss, illustrated in Fig. 279. It is plain that by this method the pressure can be far better guided and regulated, and it is claimed by its advocates that injury to the heart, intestines and bladder (these have been noted in the use of the Momburg belt) are impossible.

I have not found it necessary to use either of these methods, though I can see no objection to the use of the Gauss compressor.

The above measures, if instituted while the patient still has a fairly good pulse, are, in my experience, uniformly successful. But they must be carried out in their proper order and without delay. Hesitation and indecision are responsible for most bad results.

While it is not desirable to lose time in experimenting with the many methods that have been devised for stopping hemorrhage, there are some that are too valuable to be passed without mention.

In case of great emergency the clenched fist may be used as a tampon, after the manner illustrated in the accompanying cut (Fig. 280). This is an efficacious method and especially adapted to those cases in which the physician is unexpectedly called to one of those severe hemorrhages occurring within a few moments of delivery.

A method advised by Fochier is the so-called pubiomanual compression

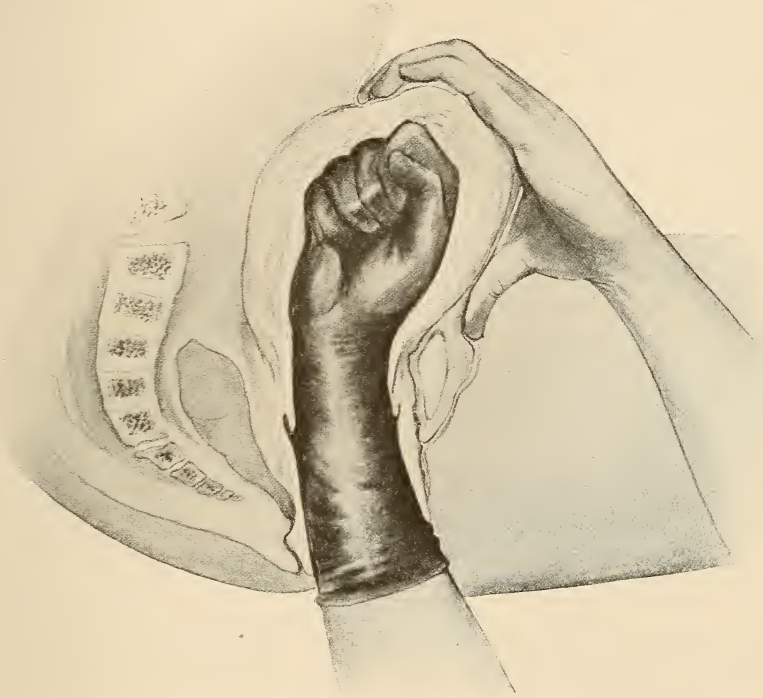


Fig. 280.—The closed fist as an emergency tampon.

(Fig. 281). In this method the strongly depressed and anteverted uterus is compressed against the pubis by means of one hand placed above and behind the uterus. The other hand is made to prolong the plane of the pubis in front, and both hands are then strongly approximated. Thus the uterus is compressed along its entire length. This method, it will be noted, does not require the introduction of the hand into the uterus.

Either of these methods may be useful in an emergency. Neither is as satisfactory as a thorough tamponade of the uterine cavity.

Compression of the aorta against the spinal column in the neighborhood of the umbilicus causes an anæmia of the uterus, which reflexly

stimulates to contraction. Moderate pressure is sufficient. It must be continued for five or ten minutes to prove effectual. It is not necessary to cause pain. The pulsations of the aorta are easily felt through the relaxed abdominal wall, and the procedure may be carried out by any intelligent bystander while the physician is busy with the methods already described.

The introduction of ice into the uterus was formerly a favorite method, but ice is not sterile, and is no more effective than hot water. Ice externally, an ice-bag, or still better a piece of ice, applied over the fundus, is, however, an excellent method of maintaining contraction, once it has been

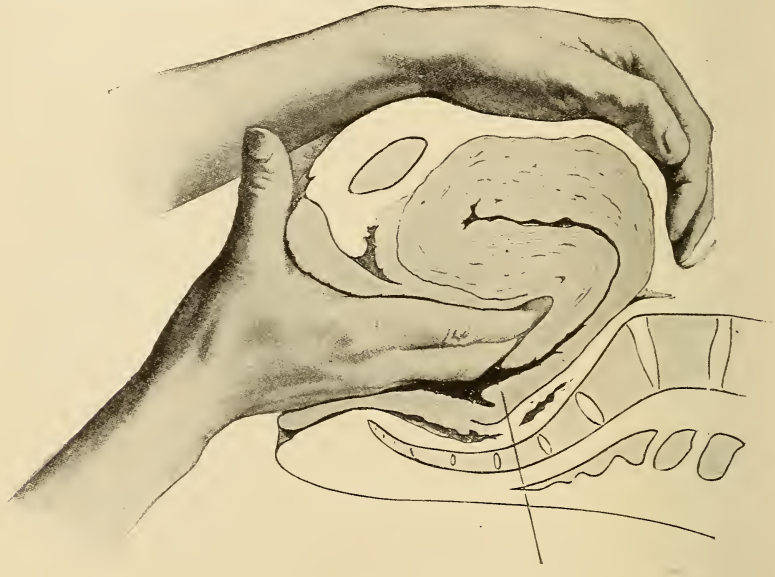


FIG. 281.—Bimanual compression of atonic uterus.

secured. It is especially useful when the uterus has not been packed, or when one is not confident that the packing has been properly done.

With the securing of good uterine contraction the troubles of the attendant are not over. He may be called upon to treat the acute anæmia that follows severe hemorrhage. There need be no trouble about recognizing it. The evidences are all too plain. The face is blanched and drawn and the features are sharply outlined. The patient seems to have grown thinner and older in an hour. The lips are as colorless as the cheeks. The temperature is normal or sub-normal and the skin is bathed in a clammy sweat.

The pulse is not rapid, as is usually stated by those who pursue their investigations in library or laboratory rather than in hospital. It does not often exceed 100 to 110. It is, however, compressible and may even become for a time imperceptible. The patient is perfectly conscious, but

betrays a certain nervous restlessness which is very characteristic. Thirst is a prominent symptom; in bad cases there may be marked dyspnœa, the air hunger of the Germans. The patient gasps for breath and asks that windows be opened. The picture is appalling, especially to the inexperienced.

Happily things are not always as bad as they seem. Many patients

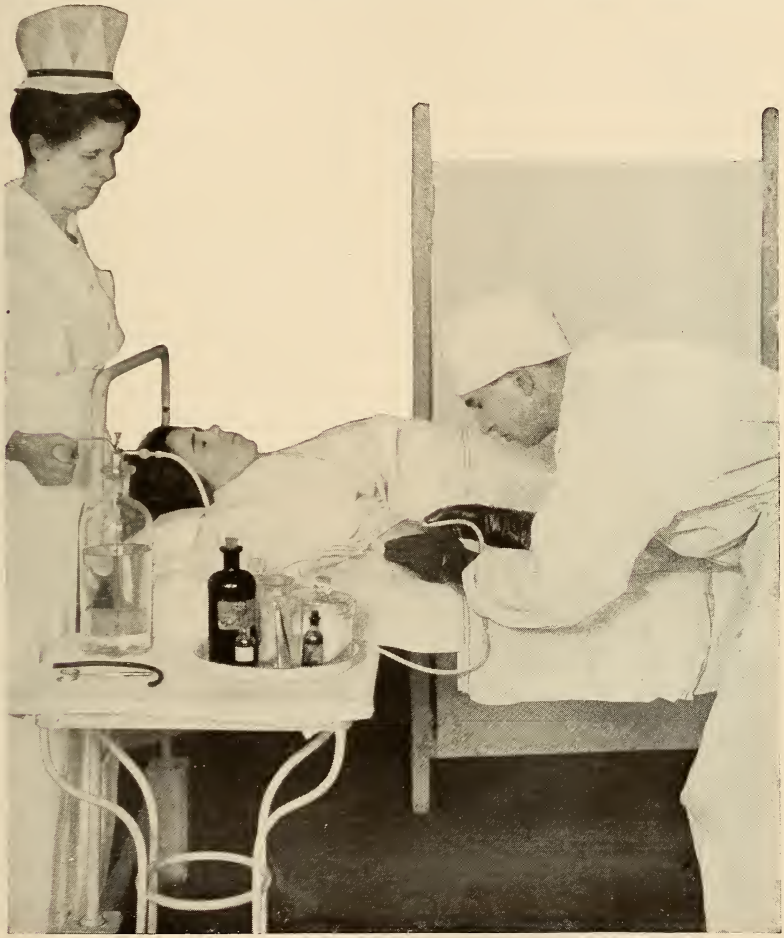


FIG. 282.—Saline infusion.

recover when apparently almost beyond hope. Therefore hope should not be given up while life lasts.

What is to be done? The first indication is to restore the volume of the circulation, thus keeping up the mechanical action of the heart. Theoretically the infusion of salt solution into a vein is the best treatment, but it is not always easily carried out (Fig. 282). The veins are colorless and collapsed, and I have seen an obstetrician of large experience work

for a long time trying to find a vein in the arm, the patient in the meantime losing not a little blood from the dissection. Hypodermoclysis, the injection of the solution under the skin, is easy and quite effective. The best site for the injection is the loose cellular tissue beneath the breasts (Fig. 283).

It should have been previously disinfected in preparation for this

FIG. 283.—Hypodermoclysis.

emergency. I recall the case of a hospital patient who developed a submammary abscess as the result of the neglect of this precaution. Very useful, too, is the high colonic injection of hot salt solution. The solution is allowed to run slowly into the bowel through a long rectal tube. The mucous membrane sucks this up greedily and very often not a drop is returned. The patient should be kept perfectly quiet with the head low,

and oxygen administered, if obtainable. Physiologists have disputed the efficacy of oxygen on theoretical grounds, but it certainly relieves the patient and probably does good. Heat externally, in the form of hot blankets, hot bottles to the extremities, hot water-bags, etc., contributes to recovery and is very grateful to the patient. It is probably better to withhold nourishment for a short time, as these patients have a strong tendency to vomit whatever is taken into the stomach, and vomiting is highly undesirable at this time, not only weakening the patient, but perhaps causing a renewal of the hemorrhage. Small pieces of ice may be held in the mouth to relieve thirst. As soon, however, as the patient is able to retain it, it is highly important that she take liquids or liquid nourishment in small quantities and at short intervals. Weak tea or coffee, wine and water, broths, gruels are all eligible, quantity being at this time perhaps more important than composition.

Of the drugs that have been used I believe that morphine hypodermically in small doses, 1/16 to 1/8 gr., is by all odds the best. It seems to relieve the cerebral anæmia, which is the cause of many unpleasant symptoms, to quiet the patient's restlessness and make her much more comfortable, and to improve the character of the pulse. If the condition is complicated by shock, strychnia, hypodermically, 1/30 to 1/40 gr., may be beneficial. On the whole, however, I do not think that for cases of pure hemorrhage it is advisable to whip up the heart by stimulants.

Hemorrhage from the Cervix

Hemorrhage from the cervix is a subject strangely neglected in many works, but one deserving careful attention. Lack of appreciation of its importance is doubtless due to the fact that tears of the cervix sufficiently extensive to cause hemorrhage occur as a rule only after difficult operative deliveries. In a long succession of normal cases and easy forceps deliveries it will not be encountered, and thus the practitioner may learn to regard it as an obstetrical curiosity, or even cease to believe in its existence.

It is no doubt true that women do not often die of hemorrhage from the cervix, but that fatal results do occasionally occur is beyond doubt, and in many unrecognized cases the patient loses so much blood that her convalescence is retarded and her subsequent health affected.

Etiology.—The cause is to be found in operative delivery when practised before complete dilatation of the cervix, and especially in those cases in which the fœtus is of unusual size. In my experience it is more common after high forceps operations than versions; probably because in versions the operator is obliged to dilate the cervix before he can complete the operation. The etiology has, as we shall presently see, a most important bearing upon the treatment.

Clinical History and Diagnosis.—The possibility of cervical hemorrhage should be borne in mind in all high and mid forceps operations and in all versions. In other words, in all cases in which delivery is accom-

plished before complete dilatation and retraction of the cervix. Too often the operator contents himself with the palpation of the fundus, and finding the uterus contracted, leaves unnoticed a hemorrhage which, though not great, is persistent, and if not arrested, capable of working great harm.

There is no more beautiful exercise in obstetric diagnosis than the differentiation between hemorrhage from the cervix and hemorrhage from the cavity of the uterus.

As already noted, the great and characteristic point of difference is that in true postpartum hemorrhage the uterus is relaxed, while in hemorrhage from the cervix alone it is contracted. The corpus uteri, it is true, may be well contracted in hemorrhage from the lower uterine segment after placenta prævia, but it is impossible for this complication to escape the notice of any competent practitioner.

In hemorrhage from the cavity the bleeding is much more copious and is venous in character, while from the cervix it is arterial, bright red, a trickle rather than a stream. In some cases, if the cervix is exposed, a spouting artery may be seen.

Hemorrhage from the cavity of the uterus often, indeed usually, begins before the expulsion of the placenta, while hemorrhage from the cervix, unless very severe, is not noticeable until after the expulsion of the placenta, the latter acting as a tampon.

The history of the case often suffices. Hemorrhage from the cervix does not occur after normal labors or low forceps operations.

Ocular demonstration is afforded by drawing down the cervix with tenacula. In these cases the cervix is much distorted, but with care one can always tell from which side the bleeding comes. It is usually the left.

After delivery, and especially after difficult operative deliveries, the cervix is hardly recognizable as a cervix. The anterior lip, enormously swollen, hangs down, obscuring the posterior lip, which is much smaller, and lying far back, almost out of sight.

Treatment is either prophylactic or curative. As usual the prophylactic is the most important. Hemorrhage from the cervix, like other forms of hemorrhage, can usually be avoided.

Prophylactic Treatment.—The cervix should be thoroughly dilated, and not only dilated but temporarily paralyzed, before every high or mid forceps operation, and before every version. Version for placenta prævia, of course, constitutes an important exception to this rule. The importance of complete cervical dilatation before the forceps operation and before version has been discussed in connection with those subjects. Bad tears of the cervix are less likely to occur as the result of manual dilatation than of the forcible dragging of the head through an imperfectly dilated cervix.

My experience has been, though I have never seen it in print, that one is much less likely to tear the cervix with the axis-traction forceps than in using the ordinary model, and this is what would naturally be expected.

It is a fact not generally known, or at least seldom emphasized, that in

premature labor the cervix dilates more slowly. In these cases manual dilatation is not always successful and slower measures, *e.g.*, the tampon or the bags of de Ribes, are to be recommended, if time permits.

The dangers of rapid dilatation and extraction in placenta prævia are discussed elsewhere.

Curative Treatment.—Strong pressure upon the fundus brings the cervix to the vulva, where it is easily accessible to sight and touch. Each lip, anterior and posterior, is seized by a volsellum forceps and put on the stretch by moderate traction. This traction not only enables one to determine the size and location of the tear, but for the time being *it stops the hemorrhage*. Traction upon the cervix then is the first step in all cases.

The next step is suture of the cervical tear. It is only necessary that the operator should not lose his presence of mind. The operation itself is easy. Some care is needed, it is true, in locating and seizing the posterior lip. It is not possible to photograph the actual conditions. Two or three sutures, preferably of silkworm gut, usually suffice. The first is passed near the apex of the tear; first, through the posterior lip from without inward, and then through the anterior lip from within outward and tied outside the canal, previously shown. If the operator has not placed the first suture high enough, he will at least find it very convenient as a traction suture by means of which he can fix and draw down the cervix while placing another suture above the first. Removing the sutures two or three weeks later, one finds them hanging loosely in the vagina, and is often astonished to see what a good result has been obtained from the stand-point of plastic surgery.

One or two hints to the beginner:

Never be without the necessary instruments for repairing the cervix. They are the same as those needed for perineorrhaphy, with the addition of one, or better, two, strong volsellum forceps. Though not often needed, when they *are* needed they are indispensable.

Always think of cervical hemorrhage after forceps operations and version, and if bleeding continues when the uterus is contracted.

Remember that neither ergot nor the tampon is of much service in this form of bleeding, but that the suture is prompt and certain. Do not waste your time!

Some care is needed to locate and seize the posterior lip. The relations of the two are diagrammatically represented in Fig. 270. It is not practicable to photograph the actual conditions.

Late Hemorrhages

When uterine contraction has been maintained for from one to two hours after delivery postpartum hemorrhage in its ordinary form is no longer to be feared. The attendant should not forget, however, that it is possible for severe bleeding to occur several hours after delivery as the result of profound mental shock, or of some physical exertion.

Now and then a severe hemorrhage occurs two or three days after delivery. Such a hemorrhage is almost always due to the retention of a comparatively large piece of placenta which has remained attached to the uterine wall. Of course, involution cannot proceed normally beneath the placenta. The sinuses remain open. When the placenta is finally detached, dangerous bleeding may result, as I have myself seen.

But severe bleeding at this time is rare. Much more often the hemorrhage, though prolonged, is moderate in quantity; an increase and prolongation of the ordinary *lochia rubra*. This may be due to the retention of small fragments of placenta, too small to be appreciated by the examining finger, or again, it may be due to subinvolution or retro-version.

Treatment.—Something may be done in the way of preventing these hemorrhages by carefully adhering to the rules for the proper management of the third stage, given in the chapter on normal labor, and in the avoidance of undue haste in the delivery of the placenta, especially the too early, or non-indicated, employment of the Credé method.

Profuse hemorrhage, resulting from the separation of a large piece of placenta, is best treated by tamponing the uterus, applying ice externally, and administering ergot. If the placental mass is still *in utero,* it should, of course, be removed by the finger.

Minor degrees of hemorrhage should be treated by rest in bed, the application of an ice-bag to the fundus, and the continued use of small doses of ergot. A favorite prescription of mine at this time is a mixture of ergot and hydrastis, equal parts, twenty or thirty minims three times a day.

It is better not to use the curette before the end of the fourth week. The danger of embolism is by no means negligible, and if infection happens to be present, the consequences may prove serious. Subinvolution and retro-version should be treated by the methods elsewhere described. Iron in some form easily retained and quickly assimilated, *e.g.,* iron tropon, or peptomangan, should be given and a liberal diet allowed.

Placenta Prævia

Definition.—Normally, as we know, the placenta is implanted near the fundus, either upon the anterior or posterior wall. When it is located near the cervix we speak of a low implantation of the placenta. When it borders upon, or partly or entirely covers, the internal os, the condition is known as placenta prævia (Fig. 284).

Varieties.—There are four varieties of placenta prævia:

Central or complete, in which the placenta completely covers the internal os, as the latter is accessible to the examining finger.

Partial, in which it but partly covers the os.

Marginal, in which the placenta, while implanted wholly or partly in the lower uterine segment, does not extend beyond the border of the internal os.

Cases of lateral placenta prævia are often referred to as cases of low implantation.

Frequency.—There is much difference of opinion as to the frequency of placenta prævia. It has been variously estimated as from one in two hundred to one in one thousand. My own opinion is that the former estimate is much nearer the truth than the latter; I believe that many cases of marginal and lateral implantation pass unrecognized. Doubtless many cases of abortion in the first half of pregnancy are cases of unrecognized placenta prævia.

Cragin reports that in 25,000 cases at the Sloane Maternity Hospital there were 223 placenta prævia, or one in 112. Of course many of these were sent to the hospital because they were regarded as emergency cases, and this report therefore represents a somewhat greater frequency than obtains in private practice.

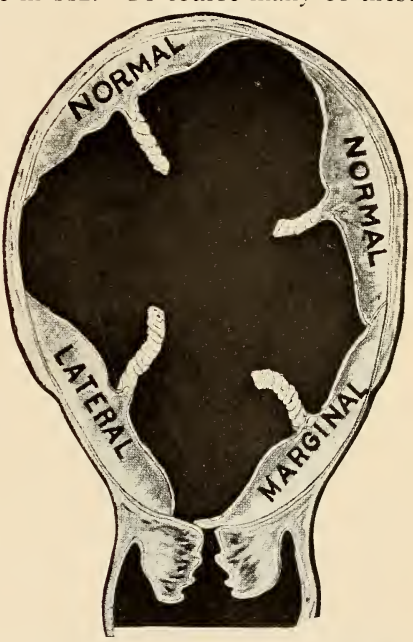


FIG. 284.—Normal and abnormal placental sites.

Etiology.—This is still largely a matter of speculation. The old idea that the ovum falls from its attachment or is detached by mechanical means is no longer tenable. As Williams aptly points out, gravity cannot be adduced as a factor, since owing to the marked anteversion that characterizes normal pregnancy the fundus is, during the early months, lower than the cervix.

What favors the arrest of the ovum in its usual location upon the anterior or posterior wall near the fundus we do not know, except that decidual development in the cornua is slight. We do know, however, that a degenerated endometrium may prevent its arrest, and this knowledge forms the basis of the most reasonable and helpful hypothesis. It is highly probable that in a great majority of cases the condition is due to a preëxisting endometritis. This was first pointed out by Strassman in 1901, and is confirmed by clinical experience, as endometritis may either prevent the implantation of the ovum in its usual position near the fundus, or, by limiting the blood supply of the decidua, make it necessary for the placenta to widely increase its area of attachment in order to secure a sufficient blood supply for the fœtus. In this way it may come to encroach upon the lower uterine zone.

The studies of Hofmeier and Kaltenbach seem to indicate that the development of the placenta from that part of the chorion, which is

attached to the decidua reflexa, may be an occasional cause, and the possibility that it may in some cases be due to structural anomalies such as malformations, tumors, low implantation of the Fallopian tubes, etc., is not to be denied. These causes, however, are to be regarded as exceptional.

In the great majority of cases careful questioning will elicit a history of abortion, subinvolution, infection, or some other cause of endometrial degeneration. In some cases there is a history of endometritis antedating a first pregnancy. Multiparity is usually given as a predisposing cause since the condition occurs about ten times as frequently in multiparæ, but this is probably true only in so far as the latter are more subject to the usual causes of endometritis, *e.g.,* subinvolution, sepsis, abortion, etc. Many primiparæ it is true have endometritis, but in such cases conception is less likely to occur.

It is claimed by Keilman and others that the placenta is sometimes developed upon the upper part of the cervix, and it has been shown that after a first pregnancy the mucous membrane of the cervix may become so modified as to be practically identical with that of the body of the uterus. We have already learned that there are many who believe that the lower uterine segment is formed either wholly or in part from the expanded upper portion of the cervical canal.

Bumm is of the opinion that since the internal os is smaller than the fertilized ovum, and is moreover filled with a plug of mucus, there is no reason why it should not be arrested at this point.

After all that which is of most interest to the practitioner is that multiparity is a predisposing, and endometritis an exciting, cause. Both facts aid in the diagnosis and the second fact suggests the prophylactic treatment.

Clinical History and Diagnosis.—Assuming the existence of pregnancy, one might almost sum up the diagnosis of placenta prævia in two words, "painless hemorrhage." Let me cite an illustration. If in the early months of pregnancy hemorrhage occurs and is accompanied by pain, both the patient and her family are much alarmed and the physician is summoned at once. But it is the pain rather than the bleeding that is the source of alarm. If in the case of a patient farther advanced in pregnancy a slight or moderate, but painless, hemorrhage occurs, it may excite little attention, simply because it is not accompanied by pain. In the first case the symptoms indicate an impending or actual abortion, in which, under proper management, the prognosis is almost uniformly good, while in the second case they strongly suggest placenta prævia, always a dangerous condition.

The first symptoms of placenta prævia, then, are often unnoticed or disregarded by the patient. Hence the importance of warning our patients that any bleeding whatever during pregnancy is unnatural and should be reported at once. The first hemorrhage usually occurs during the seventh or eighth month, though I have known severe bleeding to occur at six months, and a case which proved fatal in the fifth month, and in which the

diagnosis was confirmed by autopsy, has been reported. In this case, which I personally investigated, a severe hemorrhage, which proved rapidly fatal, followed sexual intercourse. In rare cases there is no bleeding until the beginning of labor.

The blood is bright red in color from arterial admixture, and is not to be confounded with a dirty brownish-red discharge common in certain cases of decidual endometritis. The quantity varies. The first hemorrhage is usually slight, but it may be fatal. In most cases there is sufficient warning. Manipulation of the parts in digital examination may considerably increase the hemorrhage. *Cave!*

A free and painless discharge of bright red blood from the cervix during pregnancy is practically sufficient to verify the diagnosis, even in those early cases in which the cervix will not admit the finger, and in which physical examination, both external and internal, is as yet unsatisfactory. In the eighth and ninth months, however, certain physical signs develop which furnish important confirmation.

External Signs.—In patients with a thin and relaxed abdominal wall, the location of the placenta may sometimes be defined, and when it is located anteriorly, its convex edge may be traced as a resisting ring (Polak). The experienced examiner is often struck by the fact that the head is felt at a somewhat higher level than usual. This is due to the fact that its entrance into the pelvic cavity is prevented by the placenta. For the same reason malpositions and malpresentations are more common than in normal cases. Palpation of fetal parts at the inlet may be rendered difficult.

Internal Signs.—In the latter weeks of pregnancy the cervix will be found somewhat enlarged from the increased vascularity of the parts and there may be unusually marked pulsation of vessels in the vaginal vault. These traditional signs of the text-books are by themselves of no great importance. Bogginess of the vaginal vault, however, and in particular inability to feel the head through the vagina when it can be palpated externally, are symptoms of the greatest value. In cases of placenta prævia, the cervix during the latter weeks of pregnancy is softer and more dilatable than in uncomplicated cases, and it is usually easy, even in primiparæ, to pass the finger through the internal os and feel the rough and granular maternal surface of the placenta. The competent accoucheur, however, should be able to dispense with this method of diagnosis, which obviously increases the risk of infection, and, as I have observed, distinctly increases the bleeding at a time when the mother needs every drop that can be saved.

The history of the case has some value. As we have already seen multiparity is a predisposing cause, and there is usually a history of previous uterine disease. Moreover, the condition may recur in succeeding pregnancies. I recall one case in which three successive labors were complicated by placenta prævia, severe bleeding occurring in each case.

If the hemorrhage is severe the well-known evidences of acute anæmia

are not long absent. Blanching of the face and lips, smallness and rapidity of the pulse, faintness, dizziness, etc., afford unmistakable evidence of the gravity of the condition. To wait for these symptoms, however, is inexcusable.

It is plain that the diagnosis of placenta prævia is not difficult. Mistakes are due to carelessness. The lesson is plain.

The principal symptom of placenta prævia is hemorrhage. How is the hemorrhage produced? As already stated, the placenta is normally attached near the fundus. In discussing the physiology of labor we have seen that the uterus during labor is divided into two parts, an upper contractile, non-distensible part above the ring of Bandl, the corpus uteri; and a lower distensible part, which becomes thinner and more distended during the passage of the fœtus, the lower uterine segment.

When the placenta is attached above the ring of Bandl, as in normal cases, it does not ordinarily become separated until the third stage of labor. A moment's reflection, however, will show that when it is attached to the lower uterine segment, which during labor becomes greatly distended, separation of the placenta must occur as soon as uterine contractions set in. The area of the placenta remains the same, but the area of the underlying uterine wall becomes much extended. The vessels are torn across, bleeding is inevitable. With each contraction the area of separation is increased and the bleeding becomes more profuse.

Contrary to a very prevalent opinion, however, the bleeding is most profuse, not during a contraction, but immediately after. It is not the contraction that directly causes the bleeding, but the placental separation induced by the contraction. During the contraction the vessels at the placental site are compressed by the presenting part, but as the uterus relaxes the hemorrhage is renewed.

Prognosis.—It cannot be too strongly emphasized that the maternal prognosis in placenta prævia depends largely upon the treatment. In other words, it depends upon the skill, confidence, and prompt action of the physician.

Some writers have reported a mortality of 25 per cent. or more, but such a rate could be the result only of gross incompetence or neglect.

The central implantations are the most serious, but there are exceptions to this rule. Let no one imagine that the prognosis is necessarily favorable in marginal, or even in lateral, implantations. As Bumm has pointed out, the amount of hemorrhage depends upon the size and location of the severed vessels, and may sometimes be moderate in the central variety and quite severe in other forms. Hence the supposedly mild cases should be watched as carefully as those apparently more severe.

The prognosis is, of course, bad in neglected cases or in those that have been subjected to expectant treatment until the patient has become exsanguinated. The most difficult cases to treat are those in which the cervical canal is preserved and the cervix hard. Fortunately these cases are rare.

The skilled obstetrician should not lose more than 3 per cent. of his cases, provided he has charge of them from the beginning. In no department of obstetrics does more depend upon the personal efforts of the physician than in placenta prævia. The prognosis is best in a well-conducted maternity hospital.

The fetal prognosis under all forms of treatment is bad; perhaps 50 per cent. This is due not only to the placental separation, but to the fact that most labors are either premature or operative, or more commonly both. Ordinarily, of course, the gravity of the fetal prognosis is proportionate to the amount of placental detachment, and is greatest in cases of central implantation.

Treatment.—In considering the treatment of placenta prævia a sharp line is to be drawn between the cases in which the cervix is dilated or easily dilatable, and those in which this is not the case. The first class comprises the great majority. As a rule bleeding does not occur until late in pregnancy, and most of the cases are multiparæ. In the latter, as we have already seen, one or two fingers can usually be passed through the internal os at this time without difficulty. Of course this of itself would not make dilatation easy, but the cervix in placenta prævia is, owing to its vascularity, softer and more easily dilatable than at other times. Even in primiparæ, the cervix is usually soft and easily dilatable, the cervical canal is nearly or quite obliterated, and dilatation is easily effected. Then, too, the condition tends to cause premature labor and it often happens that some degree of dilatation has already been attained by the efforts of nature.

All this is fortunate. If it were not for this, placenta prævia, serious enough as it is, would be far more formidable.

Let us then take up first the treatment of one of these typical cases of placenta prævia. The first thing to do is to rupture the membranes. This of itself is sufficient, in mild cases, to stop the hemorrhage. The escape of the amniotic fluid is followed by more vigorous uterine contractions, and the presenting part descends and compresses the placental site. Uterine retraction diminishes the bleeding area, and the placenta is drawn up with the retracting lower segment, further separation from the uterine wall being thus avoided. In many cases, especially the lateral and marginal ones, nothing more is required. Pressure upon the fundus now aids materially by fixing the presenting part in the lower uterine segment, thus increasing the compression of the bleeding surfaces, and if the fœtus is premature and small, as is usually the case, pushing the head well down into the pelvis and thus permanently arresting the bleeding. Labor may then be hastened by pituitrin or the forceps, or the case may be left to nature.

But unfortunately all cases are not as simple as this. The procedure fails to arrest the hemorrhage, or the bleeding is free, and one does not feel justified in waiting. What is to be done?

In these cases it was formerly the custom to use the tampon, and this is still the practice with many. In my opinion it is a mistake, and has been

in large part responsible for the mournful results sometimes obtained. The tampon, as we shall presently see, has a field of usefulness in certain early cases, but in the cases now under discussion it is entirely out of place. As usually applied, it is a mere pretense, and even if the application is made *lege artis,* it affords no security that hemorrhage is not going on behind the tampon. Moreover, the necessary manipulations vastly increase the danger of infection. If the cervix is dilated or easily dilatable, as it is in the vast majority of cases, no time should be wasted on the tampon. A tampon, in order to be successful, must make pressure on the bleeding surfaces. Such a tampon we have in the half breech of the fœtus. Bipolar version is in these cases no more difficult than is a thorough tamponade, and when the version is complete the danger to the mother, provided the version has been performed early enough, is practically over.

Technic.—The patient is placed upon a table. It is highly important that too much time should not be consumed, and the operator should therefore work under the most favorable circumstances. Ether, or preferably ether oxygen, should be the anæsthetic. It is folly to subject the patient to the additional danger of chloroform in these cases. No attempt at complete dilatation of the cervix should be made as in ordinary versions, but with half-hand, or if necessary the whole hand, in the vagina two fingers should be passed into the uterus and the head pushed to one side. The external hand at the fundus strongly depresses the fœtus striving to bring a foot or knee within reach of the internal fingers. It may be necessary to pass the half-hand within the uterus, but unnecessary stretching of the cervix should be avoided. When a knee has been brought to the vulva one may be certain that the version is complete. The presence of the half breech in the cervix causes vigorous uterine contractions, and thus the bleeding surfaces are doubly compressed. Moderate traction upon the foot, together with pressure upon the fundus, serves to keep up these contractions, and to maintain this compression. No attempt at immediate extraction should be made, however, unless the cervix happens to be already well dilated. Such attempts are highly dangerous to the mother. I recall a case in which death followed in about two hours. The post-mortem showed a cervical tear extending far up into the lower uterine segment. In these cases the cervix is soft (some one has compared it to wet blotting paper), and furthermore it is very vascular and bleeds freely.

When the half breech has been brought into the cervix the bleeding ceases and the mother is, for the time at least, out of danger; that is, of course, if she has not lost too much blood before the operation. The operator now has control of the situation and can proceed with all composure. He should not attempt to drag the fœtus through the cervix, until this can be done without the use of much force.

After delivery special care should be taken to prevent further blood loss, and if there is much tendency to relaxation the uterus and vagina should be promptly packed. In these cases the hemorrhage is from the

lower, non-contractile portion of the uterus, and is not always amenable to the usual measures of treatment.

Attempts have recently been made to lessen the fetal mortality in placenta prævia by the use of the de Ribes bag or some one of its modifications. Fig. 285 shows how the bag compresses the placental site while at the same time dilating the cervix. It is as yet too early to determine the value of this method. Its trial is permissible in maternity hospitals or in the hands of obstetric experts in suitable cases. More technical skill is required than in cases in which the bag is used for simple dilatation and without reference to the prevention of hemorrhage. I believe that its

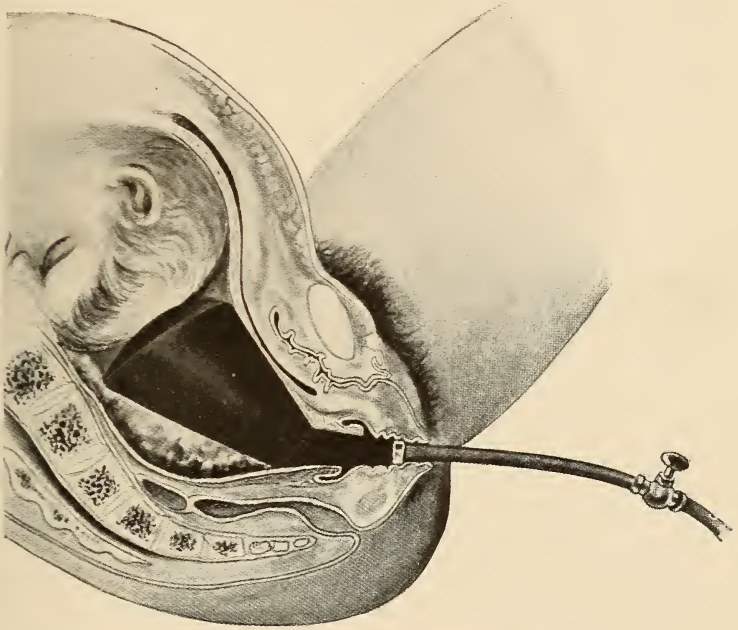


Fig. 285.—The de Ribes bag in placenta prævia.

general adoption would result in an increase in the maternal mortality with no corresponding diminution in that of the fœtus.

Theoretically this method is ideal, but in practice it has its disadvantages. It presupposes considerable technical skill on the part of the operator, who must watch the case carefully for hours at a stretch, perhaps ten or twelve hours. If the bag slips out without his knowledge, there may be severe bleeding behind it, and changes of bags are necessarily accompanied by more or less hemorrhage. If too strong traction is made, the softened cervix may tear. Considerable manipulation is necessary, and this increases the danger of infection as well as of hemorrhage.

It seems obvious that this method should be confined to hospital cases in which the child is viable and the mother has lost little blood. In such

cases it has been claimed that the fetal mortality can be reduced more than one-half. If this statement shall prove correct it will be a strong additional argument for sending cases of placenta prævia to a hospital.

Up to this time we have assumed that the cervix is dilated or easily dilatable. But this is not always the case. Placenta prævia may occur in the sixth, seventh, or eighth month, and in cases in which the cervical canal has not been taken up, or, at all events, what is left of the cervix is hard and resistant. As a rule, these cases occur before the child is viable, *i.e.*, during the sixth and seventh months. They should be regarded and treated as cases of inevitable abortion. In these cases the tampon is of great service. The membranes should be ruptured and the patient carefully watched for a short time. If the bleeding ceases, nothing more may be necessary. If not, the vagina should be tamponed, as much gauze as possible being carried up into the lower uterine segment. To be of any service the tamponade should be thorough. A little ether may be necessary. This is infinitely better than leaving the task half done.

The vaginal Cæsarean section has often been done in these cases, but is in my experience quite unnecessary, increasing rather than diminishing the risk, and often leaving the patient more or less disabled. (See p. 559.)

But suppose the patient is in the eighth or ninth month of pregnancy and the cervix is still hard and undilatable? The placenta lies across the cervix and the bleeding is free. The fetal heart-sounds are normal. Such cases are extremely rare. They do, however, undoubtedly occur. Many obstetricians have not seen one.

In a case of this kind the abdominal Cæsarean section constitutes the best method of treatment. The safety of the child is almost certain, and under modern methods the maternal mortality is probably less than it would be under a resort to forced delivery, or to the tampon and a waiting policy. The reader, however, need not fear that this choice will often be forced upon him. Many of the operations hitherto reported have been performed by enthusiastic surgeons with little obstetrical knowledge. In one case the operator gave as a justification the fact that the os was *no larger than a half dollar.*

The beginner is likely to show some timidity and hesitation when first meeting with this much-dreaded complication. Let us suppose the case to be one of the usual type, with a dilatable cervix that will admit one or two fingers. The hemorrhage is quite appreciable. The physician is alone, and is without special experience in obstetric technic:

The first thing to do is to rupture the membranes.

If the bleeding is not arrested turn promptly by the bipolar method and bring a knee to the vulva.

Deliver slowly. Never drag the fœtus forcibly through the cervix.

Do not make any unnecessary examinations or allow anyone else to do so. A single examination has caused fatal hemorrhage.

Remember that all manipulations are in immediate proximity to the

placental site and do not forget to wear rubber gloves and to observe strict asepsis.

Guard unremittingly against hemorrhage, not only during, but after delivery.

Premature Separation of the Normally Implanted Placenta (Accidental Hemorrhage)

In this condition the placenta occupies its normal position near the fundus, but for some reason becomes separated from its attachment. The resulting hemorrhage is called accidental, in contradistinction to the unavoidable hemorrhage which occurs when the placenta is implanted in the lower uterine zone (Fig. 286).

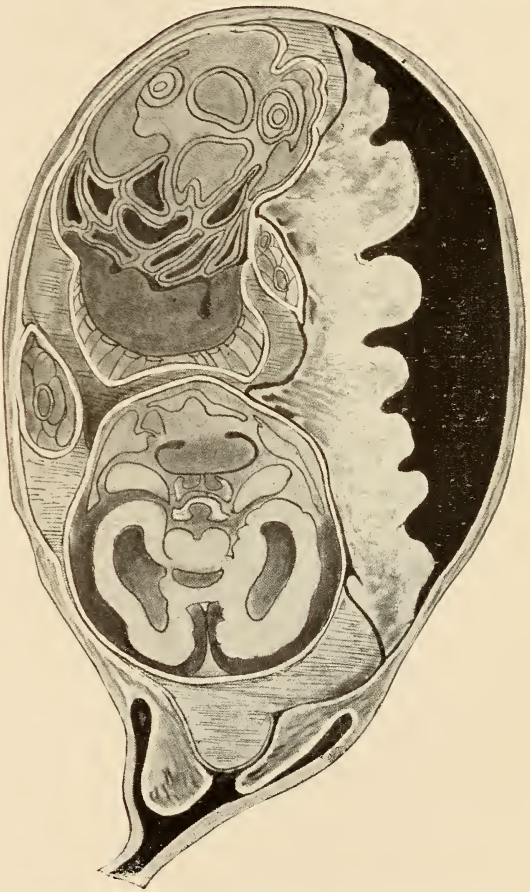


Fig. 286.—Diagram representing a total separation of normally implanted placenta. (After Pinard and Varnier, modified.)

Frequency.—Accidental hemorrhage is, fortunately, a comparatively rare phenomenon. Löbenstine and Harrar have noted its occurrence forty-seven times in the course of 42,000 cases at the New York Lying-in Hospital. Yet Holmes, of Chicago, claims that, owing to lack of proper recording, too low an estimate has been given. He concludes that there is about one case of accidental hemorrhage in 200 labors. This is based upon a report of 200 cases.

Etiology.—Many causes have been assigned. Most of them are problematical. When so many causes are given it is evident that positive information is lacking. In a general way they may be divided into two classes:

1. Traumatic, or those which come from without.
2. Pathologic, or those which come from within.

That traumatism may result in separation of the placenta is *a priori*

probable, and is shown by experience. I myself have seen the connection so closely that I cannot doubt it. Among the traumatic causes that have been observed or suggested are blows, falls, straining efforts, coughing, vomiting, unskilled manipulations in external version, etc. It is probable that in many cases a predisposition exists in the form of some one of the pathologic causes already mentioned.

Of the pathological or internal causes we know little. It has been shown, however, that, as in placenta prævia, the majority of the patients are multiparæ. This lends color to the assumption that endometritis in one form or another is the real cause. The coincidence of nephritis has often been noticed, and also that of syphilis and the acute exanthemata. Premature separation of the placenta is sometimes associated with fibroids. Profound mental shock has been adduced as a cause.

Separation of the placenta during labor may be caused by the retraction of the uterus after the birth of a first twin, by the traction exerted by a short cord, or by unskilful manipulations in forceps operation or version.

Mechanism.—It has been noticed in those cases in which the cause is plain, *e.g.*, in those cases which follow a blow or fall, that symptoms do not appear immediately, but are often delayed for a day or two. This I have myself observed. It has been surmised that in these cases a separation, at first slight, is increased by the contractions of pregnancy, and that the resulting effusion of blood increases the area of separation.

The bleeding may, or may not, be apparent to the eye. In the latter case the condition is called concealed hemorrhage. The mechanism of the two conditions is shown in Fig. 286. The blood may be confined between the placental and the uterine wall, causing the former to bulge inward toward the uterine cavity and the latter to bulge in the opposite direction. Sometimes this bulging can be felt through the abdominal wall. The pressure of the effused blood may rupture the amniotic sac, the blood escaping into the uterine cavity, or the blood may dissect its way downward between the membranes, which remain unruptured, and the uterine wall, whence it usually escapes into the vagina, though its escape may even in this case be prevented by the attachment of the membranes to the uterine wall, or perhaps by the interposition of a head well down in the pelvis.

Cases are on record in which a severe hemorrhage has torn the placenta completely from its moorings and the organ has fallen to the cervix, there to be mistaken for a placenta prævia. Few men, however, have been privileged to see such a phenomenon as this.

There are few cases in which the placenta or membranes are so firmly attached to the uterine wall that the blood cannot find its way eventually to the outside world. Therefore concealed hemorrhage, as it is called, is much more rare than the external form. Concealed hemorrhage is almost always followed sooner or later by the appearance of blood externally. This occurred in all of DeLee's cases.

Symptoms.—The symptom of the concealed form is severe localized pain near the fundus uteri. This is due to the separation of the placenta from the uterine wall. As Herman has pointed out, the uterus will tolerate a great deal of gradual stretching, as in hydramnion and twin pregnancy, but will not tolerate sudden stretching. Owing to the increased tension, the uterus becomes round rather than oval and acquires a sort of wooden hardness which is very characteristic, the *uterus de bois* of the French writers. With these symptoms there develop rapidly the evidences of acute anæmia, the pallor, the faintness, dizziness and thirst, and the small and rapid pulse and other signs which we have already studied. At first there is no blood to be seen, later, perhaps, a little bloody serum, squeezed from the retained clots by the uterine contractions. These symptoms, occurring during the latter months of pregnancy, can have but one meaning.

The diagnosis of the external form presents no difficulty. If hemorrhage occurs during labor, and examination shows that the placenta cannot be reached, this fact, together with the other symptoms already mentioned, is quite sufficient.

Even though the hemorrhage appears during the latter months of pregnancy, and before the cervix will admit the finger, there should be no trouble in diagnosing a well-marked case. The localized pain and the physical signs already mentioned are highly characteristic. A history of recent traumatism, or of some one of the predisposing causes, is very significant. Furthermore, there is no thickening or bogginess in the vaginal vault, and the presenting part can be easily palpated both externally and through the vaginal vault.

Treatment.—There are many cases in which the hemorrhage is slight. After some overexertion there is a trifling hemorrhage, accompanied, perhaps, by certain ill-defined nervous symptoms of reflex origin. In these cases a few days' rest in bed is all that is necessary. The patient should be kept under observation, however, and cautioned against any undue exertion during the remainder of her pregnancy.

But suppose that the hemorrhage is severe? The first thing to do is to rupture the membranes. The propriety of this has been disputed upon theoretical grounds, but experience has shown its efficacy. A tight bandage is now applied and thirty drops of the fluidextract of ergot given every four hours.

The further treatment depends upon the condition of the cervix and the period of pregnancy. Should the cervix be dilated (which is not usually the case), delivery is accomplished by version or forceps, according to indications. If the child is dead it should be promptly perforated.

Probably the cervix is not dilated. What then? If the fœtus is premature or small, it is better to wait, meanwhile keeping up the uterine compression and the ergot, and perhaps giving pituitrin as well. As Herman has well said, we are to judge the size of the fœtus in these cases not so much by the menstrual history as by the height of the fundus. His rule

which I believe to be a very good one, is to persevere with the above method of treatment in all cases in which the fundus does not extend higher than a point halfway between the umbilicus and the ensiform cartilage.

Now and then, fortunately not often, the case has gone on to term, the fœtus is large, the cervix undilated, the symptoms grave. In such cases we are told to dilate the cervix manually or by the Bossi dilator and to deliver as rapidly as possible either by forceps or version. To this I cannot subscribe. Such an *accouchement force* is highly dangerous even to patients not already exsanguinated and shocked.

For such a case the Cæsarean section, performed *lege artis* under ether oxygen anæsthesia, constitutes the quickest and safest way out of the difficulty. If the requisites for this are not at hand, the best that can be done is to dilate the cervix manually up to the point of admitting one or two fingers, rupture the membranes, insert a de Ribes bag, and use compression and ergot as already described. Use pituitrin to stimulate contractions. Perforate if the child is dead.

CHAPTER XXIII

CONTRACTED PELVIS

Pelvic Contraction and Deformity

Historical Note.—Previous to the eighteenth century but little of value was known or, at any rate, published, about pelvic contraction as an obstacle to labor.

Van Deventer, in 1701, was the first to approach the subject from a comprehensive and scientific stand-point.

Smellie in England, and Baudelocque in France, writing about the middle of the eighteenth century, made important contributions. Smellie demonstrated very clearly the mechanism of labor in contracted pelves. His illustrations of the passage of the fetal head through the pelvic brim and of its conformation and moulding leave nothing to be desired even at this day.

Baudelocque busied himself especially with pelvimetry. It was he who first demonstrated the diameter which bears his name, the anteroposterior, or external conjugate, most important of the external measurements.

Michælis and Litzmann, professors at the University of Kiel, have done more than any others in modern times to establish the subject upon a scientific basis, and the classification of Litzmann, 1861, is still for practical purposes the best devised.

More recently Schauta, Breus and Kolisko, and others have studied the subject from an etiological and developmental stand-point and have made elaborate classifications, which, while interesting from the stand-point of pure science, are for practical purposes less valuable than that of Litzmann, which is based upon the differences in size and shape of pelvis.

Definition.—Of course no two pelves are exactly alike. From this it has arisen that there has been some discussion as to what really constitutes pelvic contraction. The question is still further complicated by the fact that, after all, pelvic contraction is a relative term. When the fetal head is large, the pelvis is relatively contracted though it be of average size, and when the head is small a moderate pelvic contraction may offer no obstacle at all to the progress of labor. From a clinical stand-point a pelvis is contracted when one or more of its diameters is so reduced as materially to modify the mechanism of labor, but this is a variable quantity. If we must be more definite, perhaps we may say that a reduction of 2 cm. in one of its diameters, or of 1 cm. in two diameters, constitutes pelvic contraction. According to Litzmann, a pelvis is contracted if one of its principal diameters is 1½ to 2 cm. below the normal.

Frequency.—If we adopt the above figures as a criterion, we must conclude that about 15 per cent. of all pelves are contracted. According to

Bumm, pelvic contraction sufficient in amount to cause serious trouble occurs in from 3 to 5 per cent. of all cases; but pelvic contraction is far more common upon the continent of Europe than in England, Ireland, or the United States.

Williams estimates that from 20 to 33⅓ per cent. of negro patients and 7 to 8 per cent. of white women in this country have contracted pelves; his conclusions, however, with regard to white women, were based upon statistics drawn from the clinics of Boston, St. Louis and Baltimore, and necessarily include a large number of foreign-born women, and, in my opinion, do not represent the facts as far as they apply to country practice in the United States or to private practice in our cities. In these classes of cases I think that 5 per cent. would be nearer the facts.

I have no doubt that many cases of pelvic contraction are overlooked or diagnosed too late, now and then with serious results.

Etiology.—To undertake a detailed study of the many, and not always well defined, causes of pelvic deformity would carry us far beyond the limits of this work. Nor is it necessary; for what concerns the practical accoucheur is not so much the etiology of pelvic anomalies as their diagnosis and treatment. Nevertheless, it is impossible to practise obstetrics intelligently, or even to take a satisfactory history of a given case, without some general knowledge of the subject and a clear appreciation of the principles involved.

We will refer to the etiology of the different varieties of pelvic contraction as we take up each one. In a general way we may say that most of the causes are antenatal; either the patient inherits some constitutional disease or has been the victim of some failure in development, or some intra-uterine accident. Among the constitutional diseases inherited are rhachitis, the most common of all causes, osteomalacia, which many now hold to be a severe form of rhachitis and tuberculosis, or that mysterious thing known as the tubercular diathesis, a fruitful source of bone and joint disease. Among the congenital causes are chondrodystrophia or fetal rhachitis, assimilation of vertebræ, congenital dislocations, club feet, intra-uterine amputations by amniotic bands, etc.

Among postnatal causes are general diseases resulting in local deformities, *e.g.,* acute anterior poliomyelitis; local affections, *e.g.,* vertebral, pelvic, hip- or knee-joint caries or injury, osteomyelitis, fractures, dislocations and abnormal growths, *e.g.,* osteosarcoma, exostoses, etc.

In order that the pelvis may develop normally the superincumbent pressure (vertebral pressure), and the pressure from below (femoral pressure), must be normal. It is easy to see how the carrying of heavy weights, or the misdirected pressure of a deformed spinal column, may result in deformity, how unilateral lameness by confining the femoral pressure to one side may produce an asymmetrical pelvis and how, in a young child, long confinement to bed from any cause may, by eliminating femoral pressure altogether, interfere with normal development.

It is quite unnecessary to review here the anatomy of the normal pelvis. If the reader has forgotten it let him review his anatomy. It is requisite, however, to recall certain points in the development of the pelvis, and in the difference between the male and female pelvis, if we would study the subject intelligently, because in certain types of deformity the pelvis retains its fetal character, while in others it approximates the masculine type.

In the new-born the sacrum and coccyx make with the vertebral column what is approximately a straight line. The promontory is much higher, the transverse diameter is smaller, and the lumbosacral portion is much less convex, not encroaching upon the pelvic cavity, while the pelvic inclination is from seventy-five to eighty degrees as compared with from fifty-five to sixty degrees in the adult female. The sacrum, instead of being concave transversely, as in the adult, is transversely flat and relatively small. The whole pelvis is smaller and approximates the funnel shape. The iliac tuberosities are nearer each other than the ischial spines, the reverse of what obtains in the adult. The iliac bones are much smaller and form, with the ileopectineal line, an angle of one hundred and fifty-five degrees as opposed to an angle of one hundred and twenty-five degrees in the adult female.

According to Schaeffer the difference between the male and the female pelvis can be recognized as early as the fifth month of intra-uterine life. In the female the pubic arch is much wider, while the pelvis, as a whole, is more shallow. Its transverse diameter is relatively greater and it is much more capacious at the outlet. The alæ of the sacrum are much broader. The divergence begins at the fourth or fifth month of intra-uterine life, but continues long after birth; in fact, until puberty. Why these intra-uterine differences in the shape of the pelvis? Why does this sexual differentiation continue after birth and until puberty although the conditions as regards standing, sitting, walking, and the mechanical factors, vertebral pressure, femoral pressure, etc., remain the same? These are among the riddles of organic life about which it is interesting to speculate, but which as yet defy solution. Fortunately, their solution is not necessary to the solving of the practical problems which present themselves in connection with diagnosis and treatment.

On the other hand, it is easy to understand that many postnatal causes may modify the shape and dimensions of the pelvis. What these causes are, and how they act, we shall see in connection with the etiology of the condition.

The fetal pelvis is to be regarded as representing an arrest of development. There may have been a history of rhachitis, but this is by no means always the case. There are causes of arrested development other than rhachitis. The fetal characteristics already mentioned persisted through adult life. The transverse diameter is diminished and the promontory remains high. The sacrum is small and flat and situated farther back than usual. The pubic arch is small. All diameters are diminished. The brim

is round rather than oval. The sacrum and coccyx taken together form a line that is approximately straight and almost vertical. The tuberosities of the ischia are nearer each other than are the spines.

The virile or masculine pelvis approximates the masculine type. In a general way it resembles the fetal pelvis except that it is larger and heavier. The sacrum is small, the promontory high, and the pubic arch narrow. There is moderate contraction at the outlet.

Classification.—Various attempts have been made to classify the different kinds of pelvic contraction upon an etiological basis. Such a classification, however, while interesting from the stand-point of pure science, does not serve the interests of the practitioner who wishes to cull in as short a time as possible the essential facts from a mass of confusing detail and limitless minutiæ. It lays as much stress on rare forms of contraction, which the practitioner, or even the obstetrical specialist, seldom or never sees, as it does on the few varieties with which he will be sure to come in contact sooner or later, and pays as much attention to developmental anomalies and embryological curiosities as to the practical details of size, shape and measurement which are the every-day care of the physician. At the bedside he has to deal, not with disputed questions in etiology and pathology, but with the mechanical difficulties to be overcome.

To take a single example: Rhachitis causes a common form of pelvic deformity but may result in various kinds of pelvic contractions quite different from each other as regards treatment. Moreover, leading authorities in this field, as Tarnier and Budin, Breus and Kolisko, Schauta, and others, do not agree as to the etiological factors and therefore do not agree as to classification.

Certain writers have divided anomalies into those which affect the brim, cavity or outlet. To this it may be reasonably objected that in some forms of contraction all these divisions are affected, *e.g.,* in a justo minor pelvis, brim, cavity and outlet are alike contracted. I believe that Bumm is right in clinging to the older classification, and I think that that of Litzmann, published in 1861, has for practical purposes not been excelled, if indeed it has been equalled since that time.

Schauta's Classification.—This classification, as modified by Hirst, is here appended as one of the best examples of the more elaborate classifications. It makes a good framework for the study of pelvic deformity upon an etiological basis, and will be found of service to those who have time and opportunity for an exhaustive study of the subject. The student is advised to use the table for reference and as a guide to further study.

Anomalies of the Pelvis the Result of Faulty Development

Simple flat pelvis.

Generally equally contracted pelvis (justo minor).

Generally contracted flat pelvis (non-rhachitic).

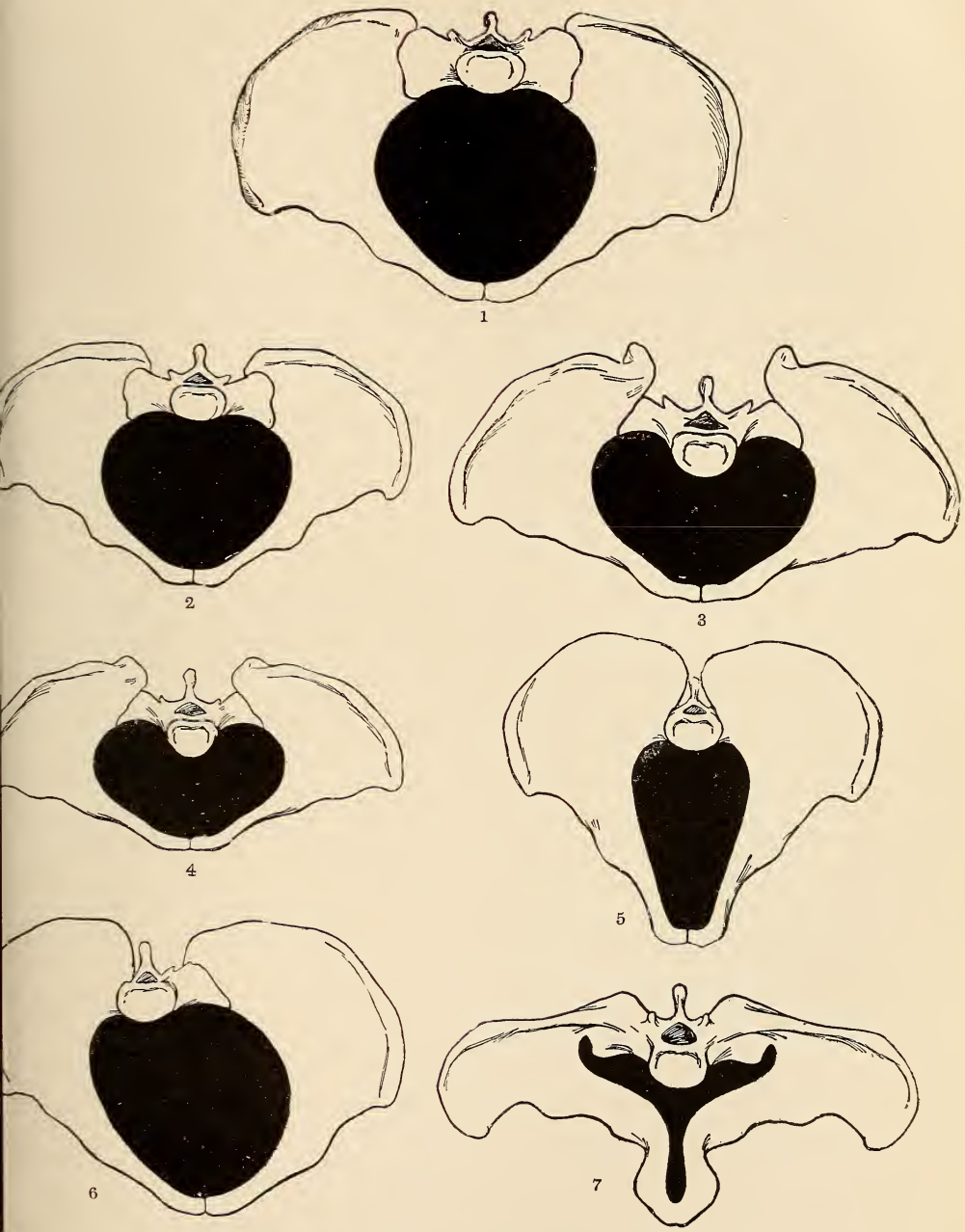


FIG. 287.—1, normal; 2, generally contracted; 3, flat; 4, generally contracted flat; 5, transversely contracted; 6, obliquely contracted; 7, osteomalacic.

Narrow funnel-shaped, fetal, or undeveloped pelvis.
Imperfect development of one sacral ala (Naegele pelvis).
Imperfect development of both sacral alæ (Roberts pelvis).
Generally equally enlarged pelvis (justo major).
Split pelvis.
Assimilation pelvis.

Anomalies Due to Disease of the Pelvic Bones

Rhachitis; osteomalacia; new growths; fractures; atrophy, caries, and necrosis.

Anomalies in the Conjunctions of the Pelvic Bones

Abnormally firm union (synostosis), which is found in elderly primiparæ, particularly at the sacrococcygeal joint and in the joints between the coccygeal bones:

Synostosis of the symphysis.
Synostosis of one or both sacro-iliac synchondroses.
Synostosis of the sacrum with the coccyx.

Abnormally loose union or separation of the joints:

Relaxation and rupture.
Luxation of the coccyx.

Anomalies Due to Disease of the Superimposed Skeleton

Spondylolisthesis; kyphosis; scoliosis; kyphoscoliosis; lordosis.

Anomalies Due to Disease of the Subjacent Skeleton

Coxalgia; luxation of one femur; luxation of both femora; unilateral or bilateral club-foot; absence or bowing of one or both lower extremities.

For the basis of clinical study, however, a classification like the following, which I have based upon that of Litzmann, and which deals principally with the more common forms, taking them up in the order of their frequency, and dealing with them from the point of view of size and shape; in other words, regarding them for the time being simply as possible or actual obstacles to the progress of labor.

Common Forms.—Flat pelvis: Simple; rhachitic; generally contracted pelvis; the flat and generally contracted pelvis; outlet contractions, including funnel-shaped pelvis.

Rarer Forms.—Oblique contractions; transverse contractions; spondylolisthesis; split pelvis; osteomalacia; pseudo-osteomalacia; irregular forms.

FLATTENING (ANTEROPOSTERIOR SHORTENING) OF THE PELVIS (FIG. 288)

Flattening or anteroposterior shortening of the pelvis is the most common form of serious deformity and will therefore be first considered. There are two varieties, the simple or non-rhachitic and the rhachitic. The

former is the most common, at all events in our own country. Some writers, it is true, believe that true non-rhachitic flat pelvis is a rarity, the form ordinarily so called being usually the result of a mild or incipient rhachitis. One often meets, however, with cases of flat pelvis in which there is no history of rhachitis and, moreover, this form of pelvis has been found in the new-born.

But we need not stop here to speculate as to the part played by rhachitis in the production of pelvic flattening. What principally concerns us at this point is that the mechanism of labor and the treatment, operative or otherwise, is the same in both varieties. They, therefore, are best considered together.

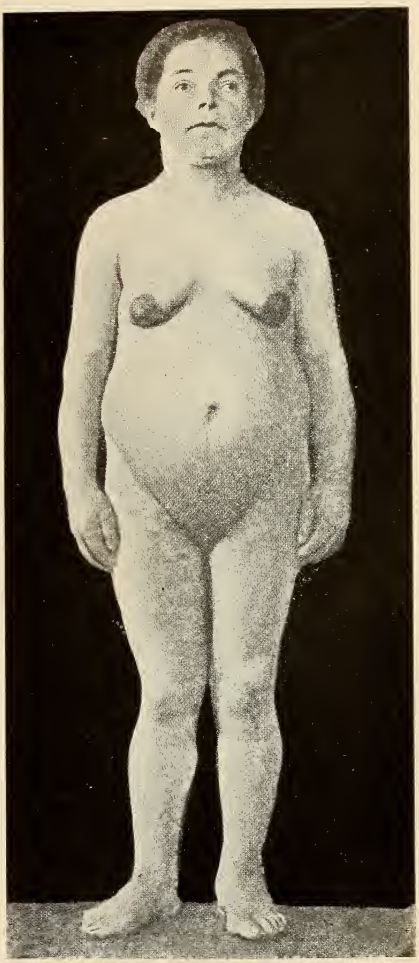


FIG. 288.—Myxœdema. Well-marked goitre. Flat pelvis.

The Simple Flat Pelvis

This form has little to distinguish it from the normal pelvis, except the anteroposterior shortening, and this shortening is rarely less than nine centimetres, the transverse diameter remaining normal. All the diameters of the brim are shortened since it is the sacrum as a whole which approaches the anterior pelvic wall, and not simply the promontory as the typical rhachitic pelvis. The general shape and curvature of the sacrum remain unaltered. This form of contraction is often overlooked by the careless observer, since the patient is of normal height and appearance. There is nothing to arouse suspicion until the external conjugate, or perhaps internal examination, shows that the sacral promontory is within reach.

Etiology.—Some of these cases are congenital, others are attributed to overwork, especially the carrying of heavy weights in early life. The part played by rhachitis is as yet undecided.

The Rhachitic Flat Pelvis

In this form of contraction the sacrum is not only pushed forward, but is also rotated forward on its transverse axis. Both these factors serve to shorten materially the anteroposterior diameter of the pelvis. The base or promontory of the sacrum is carried far forward while the rest of the bone points backward. The concavity of the sacrum, both longitudinal and lateral, is markedly diminished, the normally concave surface becoming almost flat. The tip is frequently bent upon itself. Not infrequently the first sacral vertebra projects downward as usual, the backward displacement not beginning with the first but with the second sacral vertebra. It is thus that the false promontory is formed. Sometimes this so-called false promontory is in fact the real promontory, the vertebra above not being the first sacral but the last dorsal, which has become assimilated to the sacrum.

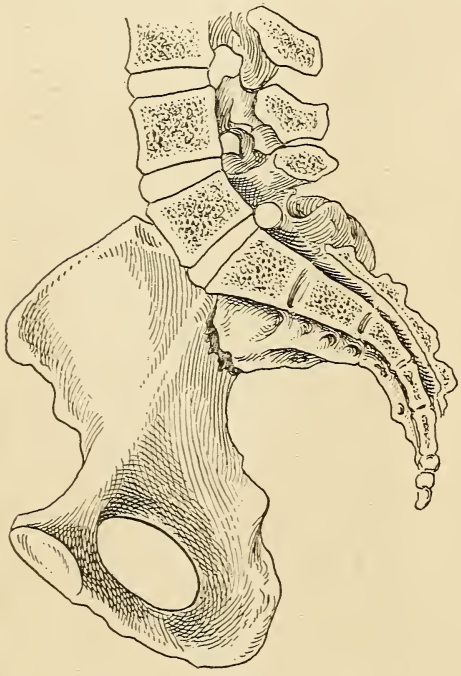


Fig. 280.—Rhachitic pelvis, median section. Contraction at the brim only. Note forward projection of the sacral promontory.

The jutting forward of the base of the sacrum causes such traction upon the sacro-iliac ligaments that the posterior-superior spines are made to approach each other behind the sacrum. This, of course, tends to separate the ilia in front and thus the spines are drawn outward and backward so that the distance between them is equal to or greater than that between the crests, an important diagnostic sign obtained in course of external pelvic mensuration. The pelvis, as a whole, is more shallow than in the non-rhachitic form, which is likely to deceive the inexperienced examiner and lead him to believe that forceps delivery will be easy, when in fact it may be difficult or impossible. The projecting promontory causes the brim to be heart-shaped. The bones are lighter and more fragile, as is usually, though not always, the case in rhachitis.

The scope of this work does not permit a study of the pathology of rhachitis. It is well to note, however, that the disease, while much less frequent in this country than upon the continent of Europe, is more

contracted pelvis. It must be borne in mind, however, that the justo minor pelvis is not necessarily confined to very small women. It is occasionally found, when least expected, in women of average or even more than average stature.

But the generally contracted pelvis is not always perfectly symmetrical,

Fig. 294. Fig. 295.

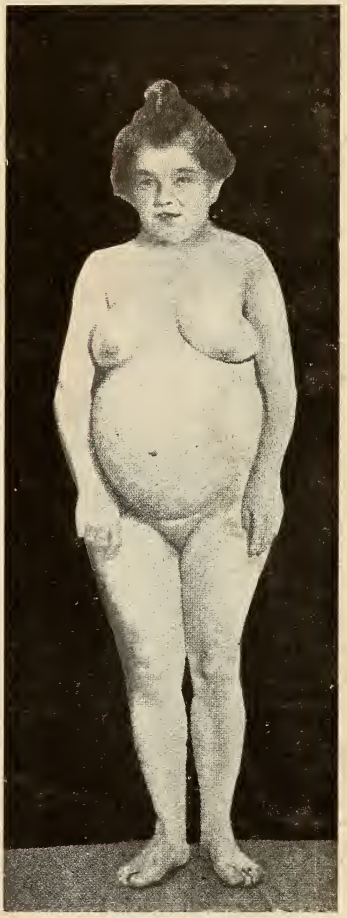


Fig. 294.—True dwarf unusually small.
Fig. 295.—Dwarf with thyroid atrophy. Generally contracted pelvis.

nor is it always proportional to the size of the patient. It is occasionally found in women of average or even more than average size, a fact which should make us realize the necessity of testing the adaptability of the head to the pelvis in all cases during the latter weeks of pregnancy. Again it

may be complicated by evidences of rhachitis, or it may approximate the infantile or the masculine type. In all these cases the condition is a real deformity. In the category of generally contracted pelves fall also the various types of dwarf pelvis, which need not be considered in detail here. It should be noted, however, that every dwarf does not of necessity have a small pelvis. The typical dwarf pelvis is simply an ordinary pelvis in miniature. The so-called chondrodystrophic dwarf is a dwarf only by virtue of having very short legs, and the pelvic diameters may be quite sufficient. Here again we see the necessity of pelvic examination. External appearances are very suggestive, but they are by no means infallible. A woman whose figure is to all appearances perfectly normal may have marked pelvic contraction, while a dwarf may have a normal labor. Of course such cases are exceptional, but the lesson they teach is plain.

Fig. 296.—Chondrodystrophic dwarf.

There are several varieties of the dwarf pelvis. In the first there is the rhachitic dwarf which is simply the rhachitic pelvis in miniature.

The cretin dwarf pelvis, which is a miniature of the generally contracted pelvis, with the imperfect bony development characteristic of cretins.

The hypoplastic dwarf pelvis, a miniature of the normal pelvis.

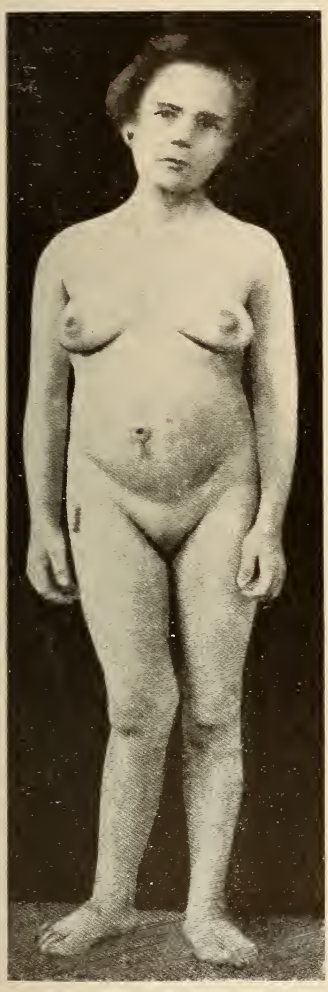
The so-called pelvis nana, or true dwarf pelvis, a miniature of the infantile pelvis, already referred to, except for the lack of ossification of the epiphyseal cartilages (Figs. 294, 295 and 296).

THE FLAT AND GENERALLY CONTRACTED PELVIS

This form combines the characteristics of both forms. It is usually, though not always, of rhachitic origin. All the diameters are reduced but the reduction is most marked in the anteroposterior diameter. It is especially in this class of pelvis that the extreme deformities, the classical types of absolute contraction, are found. Schaeffer holds it to be a transition from occupying a place between the rhachitic flat pelvis and the pseudo-osteomalacic pelvis (Figs. 297 and 298).

The three forms of contraction mentioned above are held by most writers to be the most frequent of all, although these writers do not agree among themselves as to which of the three should be accorded the place

FIG. 297. FIG. 298.



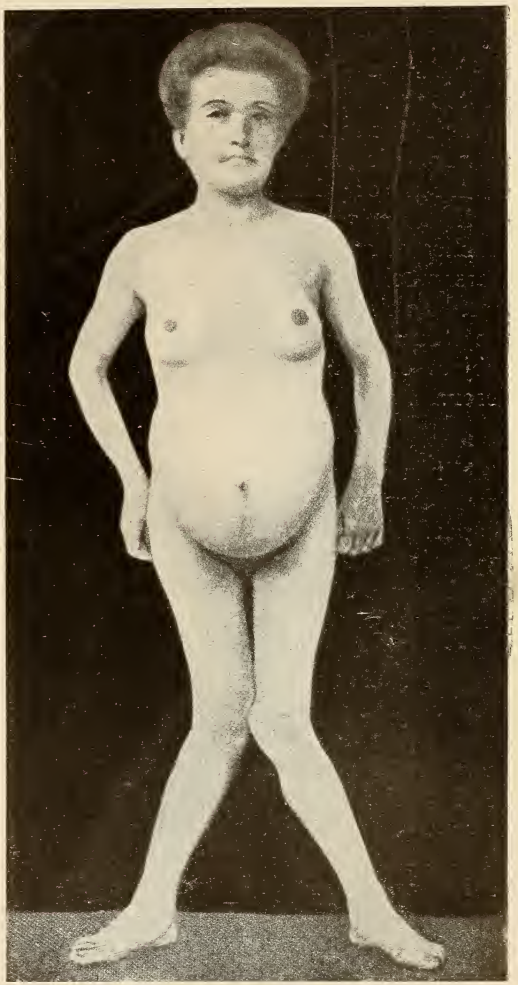


FIG. 297.—Rhachitis. Right genu valgum. Flat and generally contracted pelvis.
FIG. 298.—Rhachitis; double genu valgum. Pelvis flat and generally contracted.

of honor in this respect. Most of the German writers believe that the simple flat pelvis is the most common of the three. Ahlfeld and Bumm dissent emphatically from this opinion, believing that many cases classified as simple flat pelvis are really of rhachitic origin. Tarnier and Budin are of the same opinion. It seems to me, that the opinion of the latter authori-

ties is confirmed by the fact that in America where rhachitis is comparatively rare flat pelvis is also rare, or at all events much less frequent than the generally contracted.

It is quite probable that the relative frequency with which these types are met varies with the locality. There is no doubt whatever that the generally contracted pelvis is much more common in our own country than is either type of flat pelvis. This statement refers to women of the white race. Among negroes rhachitis is far more common.

It is true that moderate contraction at the outlet, without other apparent abnormalities, is very common. Williams, indeed, claims that 44 per cent. of all cases of pelvic contraction come under the head of outlet contractions, or funnel pelves, as he calls them. This may be true theoretically, but in practice in most of these cases the deformity is slight, involving at the worst a delayed second stage or perhaps a forceps operation and a perineal tear. To classify them all, however, as examples of pelvic deformity gives the student a wrong perspective. There is no doubt, however, that the subject of outlet contraction has not received the attention which it deserves.

OUTLET CONTRACTION (FUNNEL PELVIS)

When the pelvic canal converges from above downward instead of from below upward, as is normally the case, the pelvis is said to be funnel-shaped. As we go on we shall see that in certain unusual cases, *e.g.,* in kyphosis and in asymmetrical pelvis, this funnel shape is very constant and that in cases of general contraction a narrowing of the outlet out of proportion to the other diameters is often found. Williams has recently called attention to the fact that the outlet contraction is often found in cases where all other pelvic measurements are normal. He believes that this is due not to a persistence of the masculine or infantile type, as has been generally supposed, but to the assimilation of the last dorsal vertebra to the sacrum. This brings us to the subject of assimilation. However this may be, it is the merit of Williams to have shown that slight or moderate contraction at the outlet is the most common form of pelvic contraction observed among the white women of this country. Marked degrees of outlet contraction, it is true, are rare, but sufficient diminution in the capacity of the pelvic outlet to render the second stage long and difficult, to necessitate difficult forceps delivery, or to make bad tears of the perineum inevitable is quite common. These cases have been overlooked in the past, because so many men have been content with taking the external measurements, and perhaps the internal conjugate, and have paid no attention to the outlet diameters (Figs. 299 and 300).

THE PELVIS OF ASSIMILATION

This is an anomaly of development, a lumbar being fused with a sacral vertebra, or *vice versa.* Fusion of the last lumbar and first sacral

vertebræ, the so-called "high assimilation," results in a pelvis approximating the male type. The sacrum now has six vertebræ and, of course, the

Fig. 299

Fig. 300.

Fig. 299.—Kyphosis. Contraction of pelvic outlet.
Fig. 300.—Dorsolumbar kyphosis. Outlet contraction.

promontory is high. Sometimes it cannot be reached, at other times there is a double promontory. The brim is round rather than oval, the cavity deep and funnel-shaped, but—and this should not be forgotten—there is

sometimes a moderate transverse contraction at the brim. Thus we see that high assimilation may be a cause of delay, both at brim and at outlet. Whenever the head remains persistently above the brim and the delay cannot be otherwise accounted for one should think of high assimilation.

In some cases the upper, or first sacral, vertebra may coalesce with the first lumbar spine, making the sacrum shorter. This is called low assimilation. It is of no special clinical importance.

In some cases assimilation may be the cause of oblique contraction, one side of the vertebra resembling a lumbar and the other a sacral vertebra.

The assimilation pelvis may give trouble either at brim or outlet. While Williams calls special attention to outlet contraction, it is my opinion that it is the cause of many unexplained cases of trouble at the brim, especially since external measurements are approximately normal and promontory hard to reach.

Oblique Deformities

Although often classified as among the rarer deformities, oblique contractions of the pelvis are, in my opinion, more common than is usually supposed.

Rhachitis of the severe type is rare among native American women, but hip- and knee-joint diseases are by no means uncommon. In some cases the external measurements are normal and the pelvis apparently symmetrical, but internal examination discloses asymmetry.

I recall a hospital case in which the patient was permitted to go on for a long time in labor because her external measurements were normal and her internal conjugate sufficient. An internal examination disclosed a pelvic asymmetry and a history of severe traumatism and probable fracture of the pelvis.

These cases are especially apt to be overlooked, if a careful history is not taken. In every case in which there is a history of hip or knee trouble in childhood, or of operation upon, or injury to, the hip or knee or any part of the pelvis or lower extremity, of spinal scoliosis, infantile paralysis or prolonged recumbency from any cause, careful palpation of the lateral pelvic walls and measurements of the pelvic outlet should not be neglected. Sometimes deformity is only found on internal examination.

OBLIQUE CONTRACTION OF THE PELVIS

From the rather disproportionate amount of attention that is often given to the Naegele pelvis, and the fact that it is often designated as the Naegele, or obliquely contracted, pelvis one might suppose that other varieties of oblique contraction are rare. This is by no means the case.

Oblique contraction of the pelvis may be due to many causes and with these the reader should become familiar. The most common is one-sided pressure upon the pelvis. This pressure may be from above (vertebral pressure), or from below (femoral pressure). As an example of the

former we have lateral curvature of the spine. Examples of the latter are numerous, *e.g.*, hip- or knee-joint disease, or unilateral lameness from any cause. Other causes are dislocation, congenital or acquired, fractures, with shortening of the limb, amputations, etc. The coexistence of rhachitis, of course, makes the deformity more marked. Now and then presence of an exostosis or of a mass of callus from an old fracture diminishes the available space in one side of the pelvis. We have already mentioned assimilation as a cause of oblique deformity. It may be difficult or impossible to make the diagnosis during the life of the patient.

THE COXALGIC PELVIS

This form is the most common of all (Fig. 301) and is due to unilateral femoral pressure. Of course, the name "coxalgic" is not strictly correct,

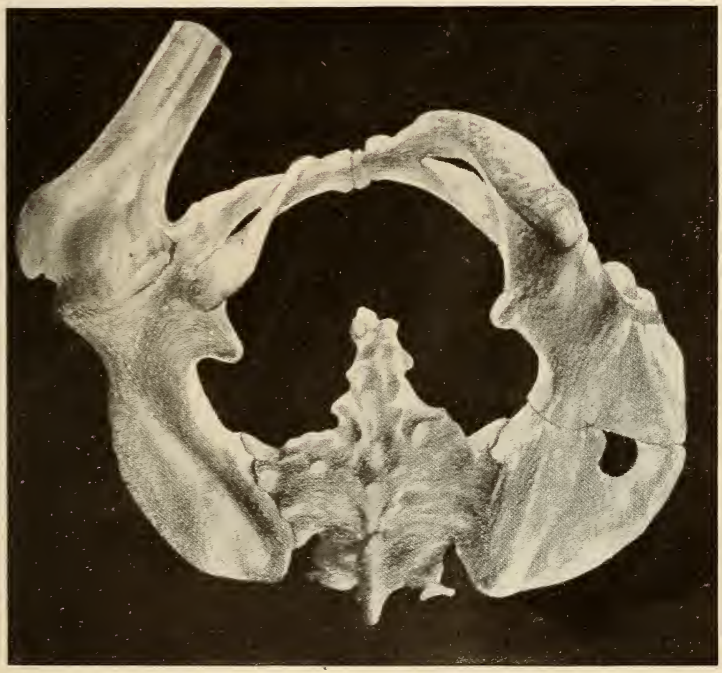


FIG. 301.—Contraction at the outlet. Coxalgic pelvis.

since femoral pressure may be due to many causes other than hip disease. The essential point is that the pressure is upon the sound side, and therefore the contraction is upon that side. There is, in these cases, a moderate lateral curvature of the spine, which, like the contraction, is usually upon the sound side.

There are some exceptions to this rule, however. When there is atrophy of the affected limb, as in congenital dislocation of the hip-joint,

there may also be atrophy of the pelvis upon the affected side, in which case the contraction may be upon the same side.

FIG. 302.—Transverse contraction at the brim.

THE NAEGELE PELVIS (OBLIQUELY CONTRACTED, ANKYLOSED PELVIS)

This is a very rare form of pelvic contraction. One of the sacral alæ is rudimentary, and there is an ankylosis of the sacro-iliac joint of the same side. This renders the pelvis smaller on the affected side, at the same time pushes the symphysis in the opposite direction. The result of this is an obliquely contracted pelvis, the contraction being upon the affected side. The sacrum is twisted a little on its long axis, so that its concavity looks toward the affected side, and there is some moderate lateral curvature of the lumbar spine, this also looking toward the affected side.

TRANSVERSE CONTRACTION

Transverse contraction of the pelvis (Fig. 302) without other abnormality is not common. Of course, every justo minor pelvis is contracted in the transverse as well as in all the other diameters, and we have seen that moderate transverse shortening is characteristic of various kinds of pelvic anomaly. Well-marked transverse contraction, however, in a pelvis otherwise normal is rare.

THE ROBERTS TRANSVERSELY CONTRACTED PELVIS

Very rare, indeed, is the Roberts pelvis, the most marked example of transverse contraction. It is characterized by a lack of development of the sacral alæ on both sides, together with ankylosis of the sacro-iliac joints. It is essentially a bilateral Naegele pelvis. The reader need have little fear of encountering this anomaly, since only ten cases are recorded in the entire literature of pelvic contraction.

THE KYPHOTIC PELVIS

The kyphotic, or humpback, pelvis is usually the result of tubercular caries of the spine, though in rare cases it is due to rhachitis. When the kyphosis involves only the dorsal vertebræ, the pelvis is but little affected, but when it is in the dorsolumbar position there is a compensating lordosis of the lumbar spine, which tends to carry the promontory of the sacrum backward and its tip forward. At the same time, and as a coeffect, the lateral walls of the pelvis converge and the ilia flare outward, enlarging the false pelvis, though there is moderate contraction at the brim. Owing to the tilting backward of the sacrum the conjugate diameter is lengthened. The result of these changes is a pelvis with plenty of room at the brim, but with its capacity diminishing in the excavation and becoming narrowest at the outlet; in other words, a funnel-shaped pelvis. In some cases the outlet contraction is so great as to constitute an insuperable obstacle to delivery, except by pubiotomy or the Cæsarean section. This, however, is not usually the case, and I believe that there is danger of some unnecessary operating in these cases. To perform the Cæsarean section or pubiotomy simply because the patient has a marked kyphosis is altogether unjustifiable. I recall a patient who was sent to the Misericordia Hospital for Cæsarean section, but whom I delivered easily with the forceps. Her second labor was a precipitate one. In many cases a moderate perineal tear is the only disability involved.

In certain rare cases the lordosis is so extreme as to block the pelvic inlet. Fehling called this the *pelvis obtecta*, which means the " roofed-in " pelvis.

SCOLIOTIC PELVIS

Spinal scoliosis is an occasional cause of oblique deformity of the pelvis. It is usually rhachitic in origin. As in kyphosis the deformity must be in the dorsolumbar region in order to affect the pelvic measurements. In rhachitic scoliosis the sacrum is rotated and pushed to one side and there are corresponding changes in one lateral half of the pelvis. Owing to the coexisting rhachitis there is no outlet contraction in these cases. The contraction is at the brim.

Combinations of kyphosis and scoliosis, and of either, or both, with rhachitis may occur. Thus we may have the kyphoscoliotic, the kyphorhachitic pelvis, etc. It is obvious that to consider all possible combinations would carry us too far.

SPONDYLOLISTHESIS

This is a rare form of contraction due to an exaggerated lordosis of the lumbar spine. The last lumbar vertebra slides downward and forward until it comes to occupy a position in front of the sacrum instead of above it, osseous union taking place. By the forward dislocation of this vertebra

the vertebræ above it are dragged downward. Two, three, or even four, vertebræ may descend, with the result that the pelvis is almost completely blocked. So great, indeed, is the deformity in some cases that one can feel the bifurcation of the aorta through the vagina. The sacrum is displaced downward and backward and rotated upon its transverse axis. There is a compensatory action upon the symphysis which is brought to a higher plane than usual. Pelvic inclination disappears, the plane of the brim becoming practically horizontal. The pelvis assumes the funnel shape of the kyphotic pelvis.

According to Neugebauer the condition is due to imperfect development of the interarticular portion of the last lumbar vertebra. Cases have been observed in which it was due to fracture of the vertebra. Of course, if ossification does not occur, we have cartilage instead of bone and the anterior part of the vertebra may slide forward and downward. Carrying of heavy weights has been adduced as a cause. Arbuthnot Lane cites the case of the coal heavers.

The appearance of the patient is characteristic. The descent of the lumbar spine causes the thorax to drop, as it were, into the pelvis, and the lower ribs are almost on a line with the pelvic brim. The patient has a peculiar waddling gait.

OSTEOMALACIA (MOLLITIES OSSEUM)

This disease is almost unknown in England, France, and America, but endemic in central and southern Europe, and recently in Japan. It is attended by pain and tenderness affecting the bones and especially those of the vertebral column and pelvis, confining the patient to bed during pregnancy and resulting in various and often extreme deformities, and followed by decrease in stature. With termination of pregnancy the symptoms disappear. The bones are softened and easily bent. Indeed, the condition is sometimes called compressed pelvis. The microscope shows the characteristic changes of osteitis and osteomyelitis. The softened bones yield easily to pressure and sometimes take on fantastic shapes. Pressure from above (vertebral pressure) pushes the promontory downward and forward, while pressure from below (femoral pressure) drives the lateral walls of the pelvis toward each other, giving to the pelvic brim the classical "beak shape" of osteomalacic pelvis.

The etiology is not definitely settled. As in rhachitis, poor hygienic surroundings constitute a predisposing cause. Fehling regards it as a trophoneurosis due to certain changes in the ovaries not well understood. Certain Italian writers believe the disease to be of bacterial origin, but this theory has not received a ready acceptance.

No other disease presents the same symptoms as this, especially the shortness of stature. In the early stages it may be necessary to wait for a time, however, before making a positive diagnosis.

THE PSEUDO-OSTEOMALACIC PELVIS (COMPRESSED PELVIS)

Pseudo-osteomalacia is the name sometimes applied to an extreme form of rhachitis in which the bones become very soft and are easily compressed into the form assumed in cases of osteomalacia, described on p. 506, including the beak-shaped symphysis. The promontory is pressed downward and forward. It differs from rhachitis, however, in the fact that while the gross appearances are much the same as in true osteomalacia it differs from the latter condition, which is an inflammatory process occurring in the adult, and in which lime salts are not replaced by cartilage, as in rhachitic children, but what remains is decalcified fibrous tissue.

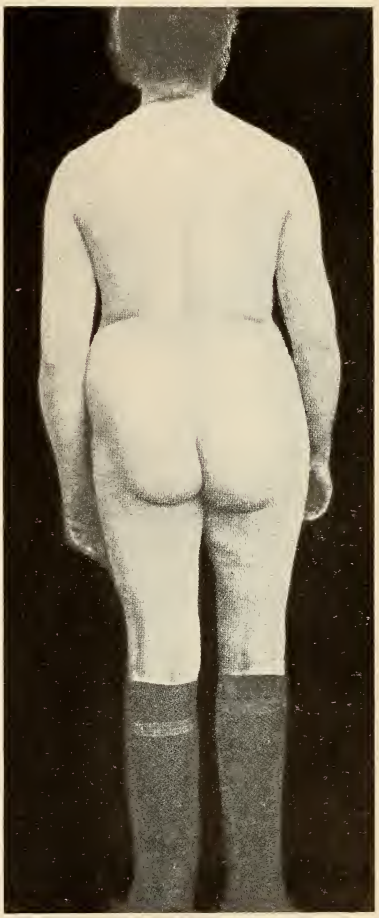


FIG. 303.—Fracture of the pelvis. Narrowing of the excavation.

There are certain irregular and atypical deformities of the pelvis which defy classification from the clinical stand-point. Among these are the various varieties of tumor that may originate in bone or cartilage. Enchondromata are the most common, but osteomata, osteosarcomata, and others, are occasionally met with. Then we may have pelves deformed as the result of fracture. Such cases are necessarily rare, in the first place because fractures of the pelvis are rare, and in the second place because they are ordinarily the result of great violence and therefore often fatal. They do occasionally occur. Now and then it is not the fracture *per se* that causes the difficulty, but the callus that is thrown out during the process of healing.

It remains to mention for the sake of completeness two obstetric curiosities, the split pelvis and the pelvis spinosa, though the reader, even though he be an obstetric specialist, will probably never see a case of either.

The pelvis spinosa is characterized by the presence upon its inner surface of small, sharp, bony projections which have been known to injure the uterus during labor and which it would seem might also injure the child, although they are not usually large enough to constitute an obstruction to the progress of labor.

The split pelvis is a developmental anomaly and is usually associated with exstrophy of the bladder. The pubic bones are completely separated from each other, or united only by a fibrous partition. Less than ten cases are on record.

Litzmann has reported a case of absence of the sacrum and one of delivery after operative removal of the sacrum. It is also well to remember cases due to accident (Fig. 303).

JUSTO MAJOR PELVIS

A pelvis is said to be justo major when all its diameters are larger than usual, but the pelvis as a whole is symmetrical. This can hardly be called an abnormality. It is said to be a cause of precipitate labor, but I do not believe this to be the case. In the absence of pelvic contraction or unusual size of the head, delay in labor is due for the most part not to the pelvis, but to the soft parts. For example, in the case of a primipara the head has normally descended into the cavity of the pelvis long before the beginning of labor and it is the condition of the pelvic floor that determines the rate of progress. Similarly, in the case of a primipara, the head usually descends to the floor of the pelvis as soon as the cervix is fully dilated.

History.—If the practitioner would avail himself of every diagnostic aid, he should review carefully the life history of every case. Inquiry should be made as to evidences of rhachitis in infancy, *e.g.*, late dentition, late walking, delayed closure of fontanelles, sleeplessness, bottle-feeding, etc. A history of infantile paralysis, of hip-joint disease, of "white swelling" of the knee, of resection of the knee-joint, or of any condition that might cause unilateral lameness, is always highly significant. History of long confinement to bed before the age of twelve, for any reason whatever, is very suggestive.

Most important of all, in doubtful cases, is the history of previous labors, if any, including the size of the children and their condition at birth, whether still-born, deeply asphyxiated, or normal, and the character of delivery, whether natural or operative. The character of previous operations, the difficulties with which they were attended, where and by whom they were performed, and their results, should be matters of investigation.

The nationality of the patient should not be overlooked. Rhachitis, for example, is much more common in women of continental Europe and in the negro race. Osteomalacia is almost unknown in America.

Inspection.—The attention of even the casual observer is at once arrested by unusual shortness of stature, marked spinal curvature, a limping or one-sided gait, hemiplegia, operative scars about the hip- or knee-joints, or now and then by the scar of a former Cæsarean section or pubiotomy. This happened in one of my cases, the patient denying any knowledge of the character of the operation from which the scar resulted.

Then, too, there are often the classical evidences of rhachitis, the peculiar shape of the head, irregular teeth, projecting lower jaw (prognathism), curvature of the bones of the extremities, "knock knees," "pigeon breast," enlargement of the costal cartilages (the rhachitic rosary), and the square-shaped fingers of the rhachitic hand. Anomalies of the *Raute of Michælis,* described below, are also highly suggestive. According to Fabre the average height of women is 1.6 m. and this is rarely attained in cases of pelvic contraction, especially of the rhachitic type. Let us not, however, overlook the cases which do occasionally occur in taller women.

When we come to the inspection of the abdomen there is much that speaks plainly: most noticeable is undue prominence of the abdominal tumor. In the primipara this takes the form of a pointed abdomen, the *Spitzbauch* of the Germans. Quite otherwise in multiparæ. The lax abdominal wall of the woman who has borne many children can no longer support the enlarged and heavy uterus which hangs forward over the symphysis, sometimes indeed so far that the fundus is lower than the cervix. This condition is known as pendulous abdomen, *Hängebauch* of the Germans, *ventre pendant* of the French.

Of course both varieties of abdominal distention are usually due to the fact that the fetal head cannot enter the brim and the entire fœtus must remain in the abdominal cavity. An added factor, as we shall see later, is to be found in the fact that in certain varieties space is diminished. Hence, even when, as in outlet contraction, the head has descended into the pelvic cavity, the intra-abdominal space is still insufficient.

In cases of well-marked contraction at the brim the outline of the head above the symphysis may be plainly seen, as well as felt, through the abdominal wall, resembling very much a distended bladder.

Whenever in the case of a primipara the head remains above the brim during the latter weeks of pregnancy and cannot be made to descend by external pressure, one should think of pelvic contraction. This is a very suspicious sign, and sometimes indicates pelvic deformity which cannot easily be made out by vaginal examination, *e.g.,* the so-called "high assimilation," of which we shall say more presently.

On the other hand, in outlet contractions the head may be far down in the cavity of the pelvis, and again in certain forms of rhachitic pelvis the pelvis as a whole is so shallow that the head appears to be relatively much lower than is really the case.

THE RAUTE OF MICHÆLIS

Among the evidences furnished by inspection the *Raute of Michælis* is one of the most significant. It can be better illustrated than described. The four depressions or dimples, shown in Fig. 304, can, except in the case of very stout women, be made out without trouble. *A* corresponds to the depression below the spine of the last lumbar vertebra, *B* and *C* to

the posterior-superior spines of the ilium, and *D* to the upper end of the intergluteal fold. When this figure is of average size and shape, a normal pelvis is probable, though of course not certain. Variations in its size and shape are, however, highly significant. If, for example, the lateral depressions are far apart, one thinks of a large sacrum and an ample pelvis. If they are close together it is probable that the pelvis is of the infantile or of the masculine type. If the upper depression is nearly in line with the lateral depressions this indicates that the sacrum has been pushed downward and forward, as in rhachitic flat pelvis and in certain cases of spinal curvature. When the figure is irregular, *e.g.*, when one lateral depression

Fig. 304.—The *Raute of Michaelis.*

is on a lower level than the other and nearer the median line, we are at once reminded of an oblique contraction. The student will do well to study the *Raute*, first in normal cases and later in every abnormal case which he may be so fortunate as to meet.

Pelvimetry

Valuable as are the evidences of history and inspection, we possess a more exact method in the actual measurement of the pelvic diameters. There are two kinds of pelvimetry, external and internal. External pelvimetry is that part of pelvimetry that can be done under the guidance of the eye, and consists in measuring certain diameters.

1. The interspinal diameter, or distance between the anterosuperior spines of the ilia, 26 centimetres (Fig. 305).

2. The intercristal diameter, or the distance between the crests of the ilia, 29 centimetres.

FIG. 305.—Measuring the distance between the iliac spines.

3. The intertrochanteric diameter, or the distance between the trochanters, 32 centimetres (Fig. 306).

4. The external conjugate diameter, or diameter of Baudelocque, 21 centimetres (Fig. 307).

5. The right and left oblique diameters, taken from the right posterior-superior spine of the ilium to the anterior-superior spine of the ilium on the left, and *vice versa,* 22 centimetres.

FIG. 306.—Measuring the distance between the trochanters.

6. The intertuberal, or transverse, diameter of the outlet, 11 centimetres.

How are these measurements to be taken and what do they respectively indicate? They are to be taken with the pelvimeter. Its construction and

the method of use are sufficiently indicated in the accompanying illustrations. Type forms are the pelvimeters of Baudelocque and Collyer. The latter is more convenient for the practitioner, since it can be carried in

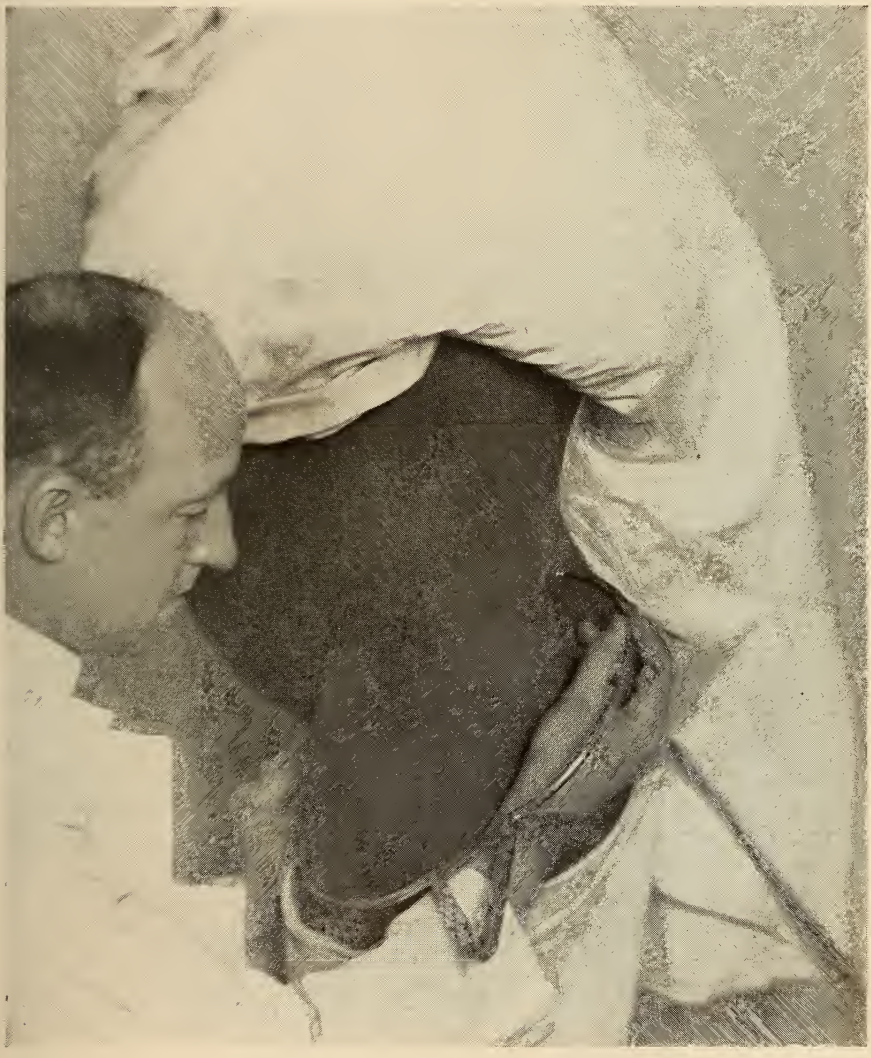


FIG. 307.—Measuring the external conjugate.

the pocket or the obstetrical bag. *Test every pelvimeter with a tape measure or a foot rule.* Not all pelvimeters are accurate.

The interspinal and intercristal diameters indicate approximately the transverse diameter of the pelvis and the inclination of the ilia. As

explained elsewhere, if these diameters are equal, or if the interspinal is the larger of the two, a rhachitic pelvis is to be suspected. Shortening of an oblique diameter is found in hip-joint disease and similar conditions. Marked diminution of the intertrochanteric diameter indicates transverse narrowing. Most important of all external measurements is the external conjugate diameter, or the diameter of Baudelocque, indicating as it does with approximate accuracy the anteroposterior diameter of the pelvic brim. The intertuberal diameter, by which is meant the distance between the tuberosities of the ischia, should not be forgotten, or we will occasionally overlook a case of outlet contraction.

In taking the above measurements the points of the pelvimeter should be placed squarely upon the external surface of the ilium. It is only in this way that a solid and uniform base for measuring can be found. The spines of the ilia can always be easily made out, and these having been located the crests, which are less definite, are made out by sliding the arms of the pelvimeter backward and forward along the borders of the alæ until the points of greatest separation are determined.

In taking the external conjugate one tip of the pelvimeter is placed on the anterior upper surface of the symphysis, exactly in the median line, while the other is placed in the centre of the depression, just below the prominent spine of the last lumbar vertebra, which can usually be felt without difficulty. If this landmark is not available, as may be the case in fat women, a very close estimate may be made by locating a point two and one-half centimetres above a line midway between the two lateral depressions below.

Baudelocque, who was the first to appreciate its importance, believed that it bore a very definite relation to the true conjugate, but this has been shown to be incorrect. Various factors, especially the height and thickness of the sacrum and the thickness of the symphysis, operate to prevent exactness.

Nevertheless this diameter is an important one, since experience has shown that when it is less than 17 to 18 centimetres anteroposterior contraction is usually present.

The right oblique diameter is taken from the right posterior-superior spinous process of the ilium to the left anterior. The patient lies upon her right side. All this is reversed in taking the left oblique. In either case the physician stands behind the patient.

THE DIAMETERS OF THE OUTLET

These are as follows:

The anteroposterior diameter, taken from the middle of the pubic arch to the tip of the sacrum, 12½ centimetres (Fig. 308).

The transverse or intertuberal diameter, 10 centimetres (Fig. 309).

The posterior-sagittal diameter taken from the middle of the intertuberal line to the tip of the sacrum. This diameter needs only to be

taken when there is distinct shortening of the intertuberal. Its significance will be considered in connection with treatment of outlet contraction.

The anteroposterior diameter is easily measured with the ordinary pelvimeter. The intertuberal diameter may be taken with Williams's pelvimeter or by the method of Klien. If the soft parts are pushed back by the hand of an assistant, the distance between the tuberosities may be directly taken with the tape measure, as I have often demonstrated, without the aid of any instrument at all.

Of course not all these measurements are necessary in every case. In the case of a multipara who has had easy labors they are not necessary,

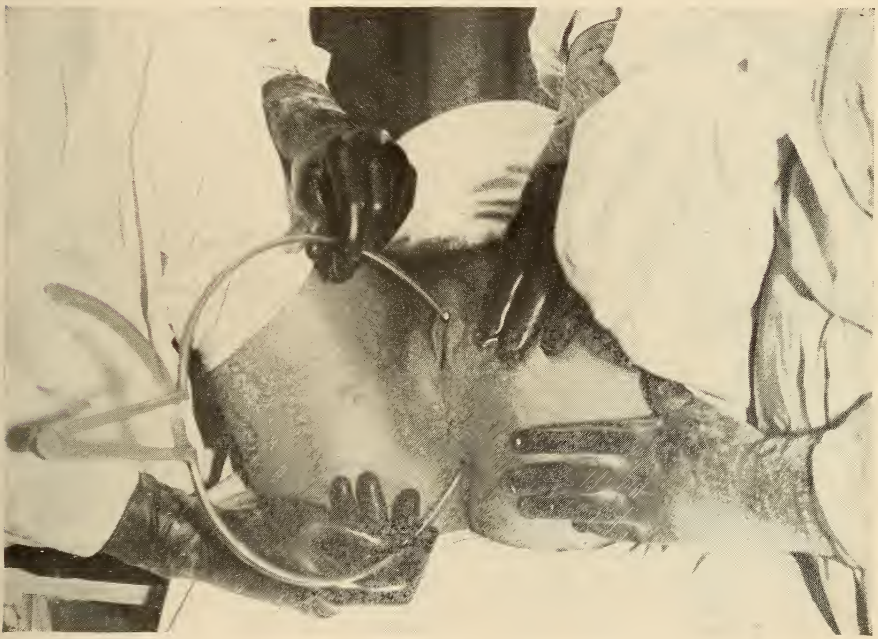


FIG. 308.—Taking the anteroposterior diameter of the pelvic outlet.

and in the case of a primipara, if the head is well down in the cavity of the pelvis, it is only necessary to estimate the size of the outlet. Again, in estimating the size of the outlet, if the distance between the tuberosities is ample, the other outlet measurements are not necessary.

If, however, the patient is a primipara and the head still remains above the brim, or if the patient has a history of difficult labor, or if the examiner is in doubt, the examination should be thorough.

Value of These Measurements.—Of these measurements I believe those of the external and internal conjugates to be the most valuable, and that of the internal conjugate to be the most valuable of all. The experienced obstetrician learns, after a time, that he can estimate the

capacity of the pelvis better with the hand than with any pelvimeter, and that internal exploration often enables him to dispense with external measurements. It will never do, however, to begin in this way. The practice of pelvimetry by the student and young practitioner is indispensable if he would safeguard his future patients. The young practitioner, too, will do well if he takes and records the ordinary measurements in every case and compares the results. I would repeat, for the sake of emphasis, that he should never omit the transverse diameter of the outlet.

FIG. 309.—Taking the transverse diameter of the outlet.

The measurement of the intertuberal diameter may be made during any vaginal examination, entails no pain or even inconvenience upon the patient, and occasionally gives highly valuable information.

Finally, he should never regard the measurement of the normal pelvis as a waste of time. For the beginner, especially, is this of great value. He who knows well the normal pelvis will not fail to recognize the abnormal.

The examiner should bear in mind the fact that we cannot rely upon external appearances. Here, as elsewhere, the practice of obstetrics is full of surprises. Now and then marked spinal or other deformity,

apparent to the eye of all, may be accompanied by a pelvis ample in size, while what appears to be the perfection of form may go with some pelvic anomaly capable of causing the most severe dystocia.

Internal Pelvimetry

While external pelvimetry affords valuable information it is, except in extreme cases not often met with in general practice, suggestive rather than positive. It is by internal pelvimetry that we seek to attain more

Fig. 310.—Taking the diagonal conjugate. Pelvis flat. Elbow not depressed.

definite information. Here, as so often in obstetrics, the best of all instruments is the hand. Various pelvimeters have been devised for internal use, but none of them are satisfactory. The experienced accoucheur needs no such instrument, while the beginner could get little information from its use. The latter should utilize from the start every opportunity of examining the pelvis; first the normal pelvis, and then the abnormal. Let him not imagine that time spent in examining normal pelves is wasted. Here again one who knows well the normal pelvis is not likely to fail to recognize the abnormal, and he who finds difficulty with his hand will hardly succeed with some complicated instrument.

The most important of the internal measurements is the anteroposterior

diameter of the pelvic brim, also known as the internal conjugate diameter, or simply as the internal conjugate. The diameter is taken, or would be taken, if possible, from the tip of the sacrum to the middle of the top of the symphysis, and measures about eleven centimetres. After delivery the promontory of the sacrum can be plainly felt through the lax abdominal wall, and the conjugate directly measured. During pregnancy this is, of course, impossible and we are obliged to resort to an indirect method which, however, gives results that are approximately correct and are often of the greatest value.

In taking the internal conjugate, the patient should be in the dorsal position with thighs moderately flexed and hips drawn well over the edge of the bed or table, preferably the latter. The elbow of the operator is held low so that the fingers are carried almost directly upward. The third and fourth fingers are folded upon the palm, and the perineum slowly and steadily pushed up by the fold between the second and third fingers. The radial margin of the hand is kept in close contact with the ligamentum arcuatum and the promontory is reached by the tip of the second finger. The common error of the beginner is to mistake some part of the concavity of the sacrum for the promontory. This is avoided by letting the finger follow the concavity of the sacrum upward, until it slips over the promontory. Sometimes there is a false promontory below the true one. Here it is best to follow the practical suggestion of Bumm: measure the distance from both and make the shortest measurement the basis of our estimate of the prognosis. If the patient is a primipara, or if she is very sensitive, a few whiffs of ether may be necessary.

FIG. 311.—Further illustration of the method of taking the diagonal conjugate. Note that the pelvis is of the male type. Conjugate ample. Elbow depressed.

When the operator is satisfied that his finger is in contact with the promontory, and that the radial border of the hand is in contact with the ligamentum arcuatum, he locates the point at which his hand touches the ligament, using the index finger-nail of the other hand for this purpose, and then withdraws both hands without changing their relative positions (Figs. 310, 311, 312 and 313). The distance is then measured. This distance is of course not the real conjugate, since it is taken from the bottom, not the top, of the symphysis. It is called the diagonal conjugate.

It is, as the reader will see at once, the hypothenuse of a triangle whose base is the length of the symphysis and whose perpendicular is the distance which we are seeking to determine—the true conjugate or distance from the top of the symphysis to the sacral promontory. Strictly speaking, the obstetric conjugate is a little below the top of the symphysis, *i.e.*, at the point nearest the promontory. The distance from the very top of the symphysis is sometimes called the anatomical conjugate. It is obvious that the diagonal conjugate is longer than the true conjugate, and that, in order to estimate the latter, a deduction must be made. Now if the conditions were the same in every case, the deduction would be the same and the estimate of the true conjugate would be an easy matter. Unfortunately this is not the case. The symphysis may be very short and the hypothenuse but little longer than the perpendicular, or it may be unusually

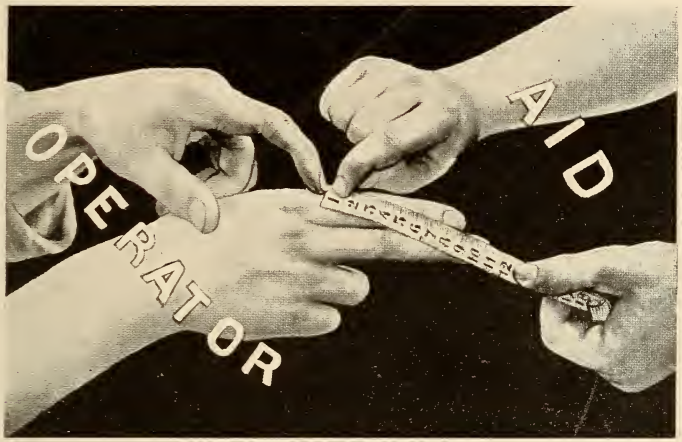


Fig. 312.—Distance measured by assistant.

long, in which case the difference between the hypothenuse and the perpendicular is very marked. In the first instance the deduction would be less than usual, in the second it would be greater.

Then, too, conditions will vary with the inclination of the symphysis and the height of the promontory. The higher the promontory the greater the deduction. If the symphysis is flat, making a very acute angle with the conjugate, the deduction will be less. If, on the other hand, it approaches the perpendicular the deduction will be greater. Under normal conditions the deduction will average about one and one-half centimetres.

Thus it appears that our methods of determining the length of the true conjugate are not very exact. Still, they are of great practical value. In some cases their positive is greater than their negative value, *e.g.*, if one can feel the promontory easily, let us say with one finger, he is certain that marked contraction exists, but, on the other hand, a promontory high and

difficult to reach may project so far as to make natural delivery difficult or impossible. This is a characteristic of the pelvis of assimilation.

Prognosis.—It is sometimes said that the prognosis in pelvic contraction is directly proportionate to the degree of contraction. This is a great mistake. Paradoxical as it may seem, the prognosis is best in cases of marked contraction; *i.e.*, of course, under correct treatment. When this contraction is made out in advance there is but one treatment, Cæsarean section at term. With this treatment properly carried out the fetal

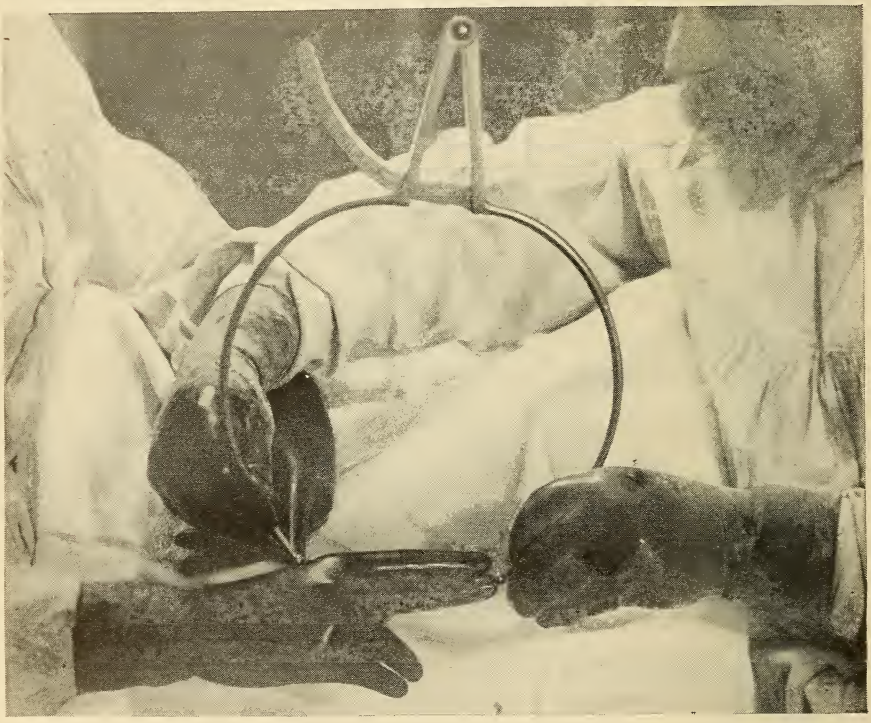


FIG. 313.—Taking the diagonal conjugate, continued. Distance measured by assistant.

mortality is practically *nil* and the maternal mortality perhaps two per cent. In the cases of border-line contraction, however, the indications are not so clear and with the best intentions and in the most competent hands the fetal mortality will be much larger, while the maternal mortality will be quite as large. Furthermore the maternal morbidity, and the number of cases in which the mother is injured more or less seriously, are very much greater. So far as the labor itself is concerned, the most important element is the character of the uterine contractions. This is especially manifest in the second stage. Powerful contractions at this time are the most important aids, and if the head is fairly compressible, sometimes

effect delivery in spite of really serious obstruction. On the other hand, weak and irregular contractions render the prospect of spontaneous delivery almost hopeless.

Effect of Pelvic Contraction Upon the Clinical Course of Pregnancy

Pelvic contraction does not make its influence felt during the early months of pregnancy. The only exception to this rule is that a projecting promontory may cause retroflexion of the gravid uterus. During the later months symptoms of pressure may be manifested, as distention and dyspnœa. Dyspnœa and gastric symptoms are the result of upward pressure, while the pressure of the head against the pelvic brim may cause œdema and congestion of the lower extremities, and markedly increase the tendency to varicosities of the vulva and lower extremities. Now and then this pressure upon nerves that cross the brim of the pelvis causes severe pain at the point of pressure or along the course of the sciatic nerve. The weight and pressure of a pendulous abdomen, or more rarely the lateral pressure of a highly mobile uterus, may cause discomfort and require an appropriate binder.

How Pelvic Contraction Affects the Mechanism of Labor

Even in normal labor the head is a close fit for the pelvis. It is obvious, then, that if the pelvic diameters are measurably diminished and the pelvic canal is to be transversed by the head there must be a corresponding difference in the mechanism by which this is accomplished. And this we find to be the case.

The difference can be briefly and clearly stated. It is not difficult to understand and should be mastered by the reader if he would be able to follow intelligently the course of labor in these cases.

As we have already noted, the first stage in cases of pelvic contraction is divided into two periods or sub-stages, the period of configuration and the period of expulsion. Before the head can advance it must be configured, that is, it must be adapted in size and shape to the canal through which it must pass. How is this accomplished? In normal labor the head is configured, or moulded, as it advances. Not only do the soft bones of the head change in shape, but the bone which is in advance, usually the anterior parietal, is pushed under its fellow and both under the occipital, and thus is the head materially reduced in size.

Let us first consider the mechanism in flat pelvis. Here the small anteroposterior diameter of the pelvic brim prevents the head from entering directly, *i.e.*, with the sagittal suture midway between the promontory and the symphysis. The result of this is a parietal presentation usually anterior, occasionally posterior. Let us consider first the former. The anterior parietal bone is found at the brim, a larger or smaller segment entering

the upper part of the pelvic cavity. The sagittal suture is felt far back, near the sacrum and running transversely across the pelvis. Only a small segment of the posterior parietal bone can be felt, perhaps none at all. The anterior parietal bone becomes fixed at the symphysis and the head under the influence of the uterine contractions gradually becomes molded sufficiently to pass the pelvic brim. The posterior parietal bone is pressed against the sacrum, it is flattened and pushed under the anterior parietal bone. During the process of engagement the larger occipital end of the head becomes accommodated to that side of the pelvis toward which it points, *i.e.,* to the larger side of the pelvis, thus substituting the shorter bitemporal diameter for the longer biparietal diameter where there is least room. After the greater circumference of the head has passed the brim, the occiput rotates to the front, and as there is usually in these flat pelves plenty of room at the outlet, the subsequent mechanism does not differ from that which obtains in normal delivery. If the examining finger notes that the sagittal suture is approaching the median line and an increasing segment of the posterior parietal bone can be palpated, the attendant may be sure that the patient is making satisfactory progress.

Less commonly, according to Litzmann in 25 per cent. of flat pelves, the posterior parietal presents. This presentation is less favorable. Lateral flexion is more marked, the head being bent sharply and crowded directly against the symphysis. Delivery may be difficult or impossible (Fig. 314).

Mechanism in the Generally Contracted Pelvis.—Here the head enters the brim in one of the oblique diameters and in a condition of extreme flexion, the small fontanelle sinking deeply so that it sometimes reaches even the middle of the pelvis, while the large fontanelle cannot be reached. This, it will be observed, is simply an exaggeration of the process observed in normal labor, by which nature endeavors to substitute for the fronto-occipital diameter the smaller suboccipito-bregmatic diameter. Extreme flexion in these cases is of good omen. Therefore, if the examining finger finds the head extended and both fontanelles easily palpable, the case is not progressing satisfactorily. On the other hand, if it notes marked flexion of the head, as shown by the descent of the small fontanelle and its approach to the median line, the outlook is favorable. In these cases, however, the difficulty is not always over with the passage of the head through the brim, since these pelves are usually contracted throughout (Fig. 315).

Mechanism in Generally Contracted and Flat Pelvis.—In this variety the mechanism is a combination of the two varieties just described. There is the anterior parietal presentation of the flat pelvis combined with the extreme flexion that occurs in cases of general contraction.

Mechanism in Outlet Contractions.—Here there is usually no narrowing at the brim, and the head is found well down in the cavity of the pelvis at the beginning of labor. This is especially true in cases of kyphotic

Fig. 314.

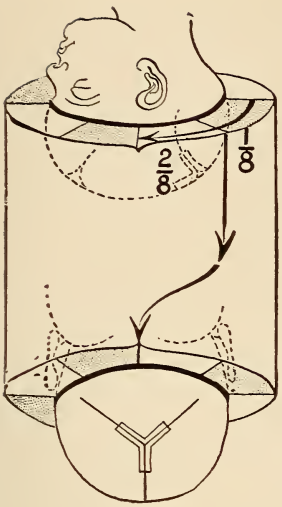


Fig. 315.

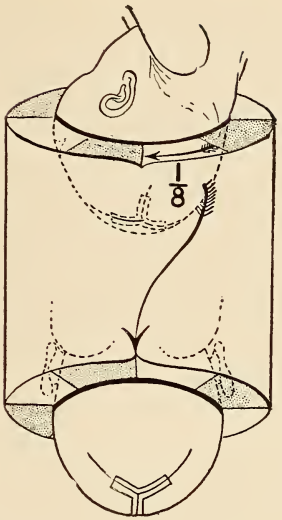


Fig. 316.

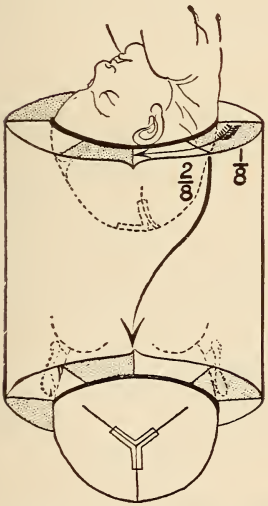


Fig. 317.

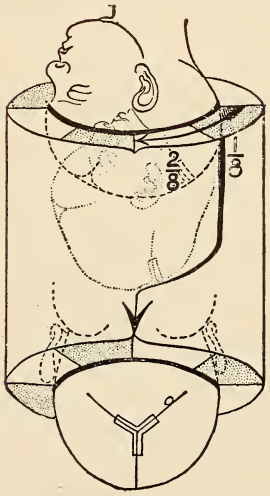


Fig. 314.—Mechanism in flat pelvis. Position L. O. T. Altitude intermediate. Anterior rotation one-fourth of a circle.

Fig. 315.—Mechanism in generally contracted pelvis. Position L. O. A. Altitude of forced flexion. Anterior rotation one-eighth of a circle.

Fig. 316.—Mechanism in flat and generally contracted pelvis, first method. Position L. O. T. Altitude forced flexion. Anterior rotation one-fourth of a circle.

Fig. 317.—Mechanism in flat and generally contracted pelvis; second method. Position L. O. T. Altitude, 1, intermediate; 2, forced flexion. Anterior rotation one-fourth of a circle.

pelvis, since the intra-abdominal space is contracted. In the movement of extension the occiput, owing to the narrowness of the pubic arch, finds its *point d'appui* not at the subpubic arch, but some distance below it. Exten-

FIG. 318.—Transverse contraction at the outlet.

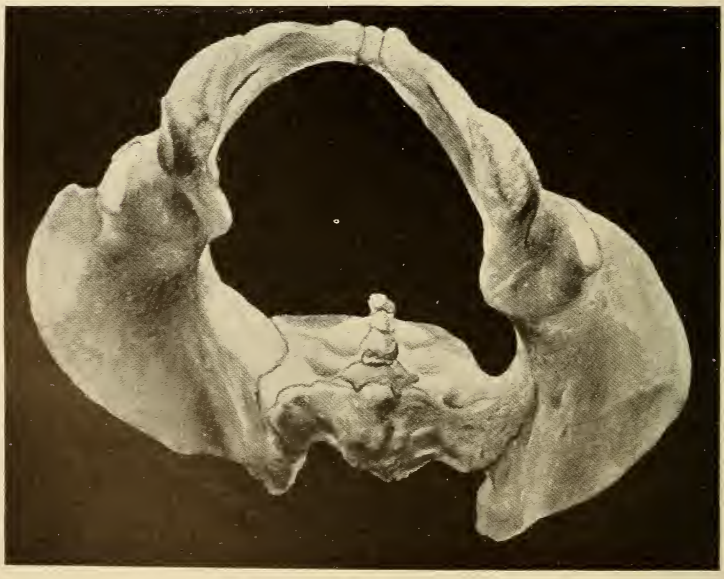


FIG. 319.—Irregular contraction at the outlet.

sion is thus rendered difficult or impossible, according to the length of the intertuberal diameter. There is usually no obstacle to rotation.

Mechanism in Irregular Forms of Pelvic Contraction.—In oblique contraction of the pelvis nature often makes an effort at accommodation by directing the occiput into the less contracted half of the pelvis, and in various atypical deformities irregular forms of mechanism have been observed, which it would be a needless and an unprofitable task to attempt to follow or describe (Figs. 318 and 319).

Effect of Pelvic Contraction Upon the Clinical Course of Labor

If the position and presentation are normal, the uterine contractions good, and the disproportion not too marked, labor may proceed with little deviation from the usual course, and delivery prove uneventful. If, however, the uterus does not contract well, or if the disproportion is marked, a characteristic train of symptoms ensues.

In the first place, malpositions and malpresentations of all kinds are more frequent and so are the various difficulties that attend them, these difficulties being, of course, increased by the scanty space available. The reason for the frequent occurrence of complications is not far to seek. The head cannot descend into the pelvis, nor can it become engaged at the brim. Hence nature's processes of accommodation result in the substitution of some other portion of the fœtus, or, the head floating above the brim, one diameter is as likely to present as another. Since the head does not enter, or at all events does not fill, the brim, the amniotic fluid escapes in large quantities and overdistends the amniotic pouch. For the same reason prolapse of the cord and of small parts is much more frequent, according to Bumm five times as frequent as under ordinary circumstances. If the amniotic pouch does not rupture, it can often be felt hanging loosely in the pelvis like a glove finger, the head high above. This sign is highly characteristic and is found in no other condition. Sometimes, even if the cervix dilates, it closes again, since the head does not come down to maintain and complete the dilatation.

But let us suppose that the head has become engaged and the cervix has at last been drawn up over the head and dilatation is nearly or quite complete. The second stage has now begun, but it differs markedly from the second stage of normal labor. Before the head can advance it must be configured or moulded to fit the brim of the pelvis, and this may require hours. How this moulding is accomplished we have already seen. When it is completed the pains become expulsive in character. Thus we have the second stage divided into two parts, the stage of configuration and the stage of expulsion. The moulding of the head and its passage through the superior strait constitute a tedious affair. When the head has become moulded so that its greatest diameter can pass the pelvic brim, the patient feels the impulse to bear down. This is an important diagnostic sign of progress. The pains, which during the stage of configuration are often of

intolerable severity, become a little more bearable, since the patient feels that she is helping herself, and the bearing-down efforts produce a certain amount of physiological anæsthesia and the area of pressure is changed. After the head has entered the pelvic cavity, if the pelvis is flat, the course of labor does not differ materially from that which obtains in normal labor. If the pelvis is of the generally contracted variety, however, the second stage may be difficult and prolonged. In funnel-shaped pelves the same thing occurs. In outlet contractions, *e.g.,* in kyphosis, there is no trouble with the first stage of labor, and it is only the delay at the outlet that attracts attention to the shortened intertuberal diameter, if this has not already been noticed.

Influence of Labor Complicated by Pelvic Contraction Upon the Maternal Structures

One would suppose that in labor under these circumstances there would be more injury to the soft parts of the mother than in normal labor, and this we find to be true. In severe cases the injuries may be of grave character. Most of them occur during the stage of configuration, when the head is stationary for hours. The familiar congestion and swelling of the anterior cervical lip are exaggerated, and sometimes the whole cervical ring that is exposed to pressure may slough away and be expelled during labor. Sometimes the prolonged pressure may result in vesico-vaginal or other fistula. The interference with the return circulation in cases of generally contracted pelvis may cause swelling and congestion of the vaginal mucous membrane, and in bad cases even the vulva may be black and œdematous. The pelvic joints may be injured and difficulties in locomotion result. Obstinate paralyses may result from pressure upon nerves that pass over the pelvic brim. Severe lacerations result from attempts at delivery. Pressure necrosis may result in severe or even fatal infection.

Effect of Labor Complicated by Pelvic Contraction Upon Fœtus

As might be expected, the fœtus shows evidence of the all-too-narrow passage. Sometimes the only reminder is moulding of the head. Except for the overlapping of the bones of the fetal skull this differs rather in degree than in kind from the moulding observed in ordinary labor. Hæmatomata are common. The projecting promontory often leaves its mark upon the head. If the reader will recall the mechanism of labor in these cases, the following diagram, modified from Fabre, will be plain. In flat pelvis it is the parietal region, and usually the posterior one, that suffers. Usually the injury is only skin deep—a superficial red line. Occasionally, however, there is a raw ulcerated surface which requires considerable time for healing. In the generally contracted pelvis the line is vertical, while in the generally contracted and flat pelvis the line takes the form of a curve.

Far more serious are the cases in which the skull is actually fractured. This is usually caused by forcibly dragging the head through a contracted brim, either during version or in the course of a forceps operation. I have seen it occur as a result of forceps delivery in which extraction was effected with the Tarnier instrument after failure with the Elliott forceps, but only at the expense of the fetal skull. When these fractures involve the top of the head they do not necessarily result badly. When near the base they are almost always fatal. If the evidences of cerebral pressure are marked the scalp should be incised and the offending fragment raised.

Doubtless many cases presenting no permanent marks of gross injury suffer later from the consequences of cerebral congestion and of minute hemorrhages.

Asphyxia due to the causes which usually obtain in delayed labor, and which operate in still greater degree in these tedious and difficult cases, is very common. Other factors which tend to increase the danger to the fœtus are premature rupture of the membranes and prolapse of the cord, both of which, as already seen, are very common in labor complicated by contracted pelvis, and all the dangers incident to difficult forceps operations, versions and extractions of the after-coming head.

Thus we see that the dangers to the fœtus in slight and moderate contraction of the pelvis are many and great. Paradoxical as it may at first sight seem, they are far greater than in cases of marked deformity. The latter are usually treated by Cæsarean section and the danger to the child is practically *nil*.

Contracted Pelvis: Treatment.—The treatment of contracted pelvis constitutes one of the most complex and difficult problems in obstetrics. In spite of the attention that has recently been given to the subject and of the enormous literature that has accumulated, there is still much difference of opinion even among men of large experience.

My own views upon the matter differ radically from those which the reader will find in some well-known and excellent text-books.

In the first place, I would earnestly warn the reader against the idea that every case of pelvic contraction needs active treatment. This mistake is often made by those who approach the subject from the surgical side without an adequate obstetrical experience; and it is in this class of cases that many unnecessary pubiotomies and symphysiotomies have been performed. Many cases of pelvic contraction require no treatment other than that adapted to normal labor. Every obstetrician of experience can recall cases in which the pelvic measurements were such as to lead him to expect serious trouble, but in which, contrary to all expectations, labor ran an uneventful course.

It is customary to divide all cases of contraction into groups, according to the degree of contraction, and to consider these groups separately. The student, however, must not imagine that the lines separating these groups are arbitrary and well defined. Since our methods of estimating the

internal diameters of the pelvis are not exact, since we cannot estimate definitely the measurements of the fetal head, and since we can never know in advance what nature can accomplish in a given case, it is obvious that such rules will be subject to many exceptions and modifications.

For these groups the length of the true conjugate is taken as a basis of classification, thus, according to Litzmann:

Group A includes cases in which the external conjugate is less than 5.5 cm., absolute contraction.

Group B, those in which the true conjugate is between 5.5 and 7.3 cm., relative contraction.

Group C, those in which the true conjugate is between 7.4 and 8.3 cm., moderate contraction.

Group D, those in which the true conjugate is between 8.4 cm. and the normal; slight contraction.

Some writers add 0.5 cm. to the conjugate diameter if the pelvis is of the generally contracted variety. I agree with Williams and others that this is not necessary. In my opinion it only serves to complicate a situation already replete with difficulties. Of course, marked shortening of the transverse diameter should be taken into account. But this is a rarity.

Strangely enough, the most marked deformity is most easily treated. This is because there is but one thing that can be done in Group A with its tiny diameter of less than 5.5 cm.—only the Cæsarean section will suffice. Not even craniotomy will permit the extraction of the fœtus. If infection is present or probable the uterus should be removed.

If the case is seen during pregnancy, the patient may ask the induction of abortion, and it has often been performed under these circumstances. In view of the comparative safety of the Cæsarean section with modern technic such a course seems hardly justifiable.

In group B the Cæsarean section is still the operation of choice, since it is impossible within the limits of this group to extract a living child *per vias naturales,* and the operation is probably at least as dangerous as the Cæsarean section.

Hence we see that in the treatment of cases with a conjugate of 7½ centimetres, or less, the problem is usually an easy one. In the great majority of cases the Cæsarean section is the only treatment to be considered. True, there is in Group B the alternative of perforation, but it is probable that under modern conditions the extraction of a full-term child through conjugate of less than 7½ centimetres, and this by an inexperienced operator, is quite as dangerous as the performance of the Cæsarean section.

However dramatic in detail and occasionally tragic in outcome these cases of extreme contraction may be, it is when we come to the cases of moderate contraction that we meet with the greatest difficulty. The characteristic feature of these cases is that one can never foretell the outcome. Many of them will be delivered spontaneously, to the great surprise and

relief of the attendant who had anticipated and prepared for some serious operation, or perhaps to the dismay of the hospital interne who had counted upon gaining valuable experience. In others a forceps operation may succeed. Occasionally a version may result happily. Again, a Cæsarean section may prove the only means of securing a living child.

I cannot agree with those who decry the seriousness of even slight contraction (nine to ten centimetres). I have seen serious dystocia in these cases. This is especially likely to be observed when the fœtus is of unusual size, and unfortunately it is difficult to be certain upon this point.

If we could put every one of these cases into a hospital, and perform Cæsarean section early in labor, results almost ideal could be obtained. Of course, this could not be done since it would involve the performance of many unnecessary operations, but there is an important practical lesson here. Every case of pelvic contraction should be treated in a hospital, or at all events under conditions permitting the aseptic and reasonably skilful performance of the Cæsarean section, should this become necessary. No doubt these precautions would prove in many cases to have been unnecessary, but this would be far more than atoned for by the fact that both fetal and maternal mortality would be practically *nil.*

But whether in hospital or without, justice demands that these cases shall be given the test of labor and in the meantime we cannot sit idly by leaving our patient to get on as best she may, until approaching exhaustion is forced upon our attention. What can we do for her in the meantime?

Most important of all is the preservation of strict asepsis. The attendant must never forget for a moment that his patient may have to undergo an abdominal section, the danger of which is enormously increased by the presence of infection. Hence the progress of the case should be determined as far as possible by external methods. Vaginal examination should be strictly limited and rubber gloves invariably used. Once the necessity of abdominal section has been determined, such examination should be absolutely forbidden. The house surgeon, as well as the practitioner, confronted with a doubtful case, should remember that his responsibility is here very great.

Next in importance is the preservation of the membranes. Their premature rupture not only delays or arrests progress, but enables bacteria to gain access to the uterine cavity, thus favoring infection. It is best avoided by the use of great care in examinations, by keeping the patient in bed in the lateral position during the first stage of labor, and by forbidding any straining or bearing-down efforts during this stage. Some writers advise the introduction of a rubber bag or colpeurynteur to prevent rupture. To my mind the influence of such treatment in preventing rupture is doubtful, and the necessary manipulations increase the danger of infection.

If at the end of two or three hours a careful examination shows that the head is still above the brim with no prospect of engagement, and con-

firms the fact that distinct pelvic narrowing exists, Cæsarean section or pubiotomy should be performed. My own results with the Cæsarean section in these cases have been good, and I have come to believe that most of the cases will do well if they have been treated aseptically and attempts at delivery have not been made. These things I believe to be of more importance than the mere duration of labor. Personally I am strongly in favor of the Cæsarean section as equally safe for the mother and far safer for the child. I believe that with the head floating above the brim it is impossible to be certain that the disproportion is not too great for the easy and successful extraction of the head after the division of the pubic bone. Such mistakes have been made and the consequences have been most disastrous.

But suppose that the physician is alone and cannot procure assistance, or if for any reason the performance of an aseptic and reasonably skilful laparotomy or pubiotomy is plainly impossible, or if such an operation is positively forbidden, what is to be done? If the child is living and viable the choice lies between forceps and version.

Technic of the Forceps Operation and of Version in Pelvic Contraction. Choice Between the Two Operations.—In a certain sense both these operations are makeshifts in pelvic contraction. Not only is their performance a difficult task, but the fetal mortality is much increased, and unless they are done *lege artis* they are by no means without danger to the mother. Nevertheless, there are cases in which they must be performed. The physician may find himself alone and may find himself obliged to operate under circumstances which render the Cæsarean section impossible, or at least extremely hazardous. It will not do for writers and teachers to assume that circumstances are ideal. The practitioner is obliged to do what is best under existing circumstances.

Much depends upon the technical skill of the operator and upon his experience in the field of pure obstetrics. This undoubted fact is not generally appreciated, and it is too often assumed that, while the Cæsarean section can only be properly performed by the surgical or gynæcological specialist, it makes little difference who makes trial of the forceps or attempts the delivery of the after-coming head. This is a grave error, as every practical obstetrician knows. As a matter of fact, either one of these procedures carried out in a case of pelvic contraction is a far more difficult task than the Cæsarean section, and can only be properly performed by one who has had special experience and training: another argument for placing all cases of pelvic contraction in a maternity hospital.

Most writers upon the subject of pelvic contraction seem to assume that the technic of both version and the forceps operation is the same as in cases in which the pelvis is normal. There are, however, certain important modifications, with which every student and practitioner should be familiar, and which may be of assistance in these trying emergencies.

There is also an erroneous, but widely diffused, idea that craniotomy

is an easy and ready way out of the difficulty in all forms of pelvic deformity; that it is an operation which anyone can perform even though he be quite incompetent to complete a simple laparotomy. When the conjugate is in the neighborhood of eight centimetres, the mutilation and extraction of a full-term child, especially if the child be large, which is often the case in these difficult labors, is a task which requires a high degree of obstetrical skill and which carries a distinct risk.

If the head remains above the brim and cannot be made to engage by rupture of the membranes and external pressure the forceps operation is usually contra-indicated, though a careful operator may be allowed a brief trial. Version, however, is usually to be preferred. This operation, it must be admitted, is something of a forlorn hope for the child, but still gives it a chance, while it furnishes quick relief for the mother and spares the operator the terrible alternative of craniotomy upon the living child. Much depends upon the experience of the attendant. One often sees men who, from lack of correct teaching, are unfamiliar with modern methods of forceps operating and use of an axis-traction instrument, but who have by virtue of necessity acquired considerable skill in performance of version.

Often the physician finds it difficult to decide between the two operations. The relative indications have been given elsewhere and need not be repeated here. It is the fashion to taboo the forceps in flat pelvis on the ground that the after-coming head enters the brim more easily, and to condemn version in contracted pelvis because the long occipito-frontal diameter becomes engaged in the shortened transverse diameter of the pelvis. There is without doubt a certain amount of truth in these contentions, but the practitioner must be guided by actual conditions rather than theoretical considerations. If, for example, in a case of flat pelvis the head can be brought down into the brim, as may happen if the head is of moderate size, it is obvious that the forceps should be preferred no matter what the rule may be. It is also plain that when some malpresentation, *e.g.*, face or brow, coexists, version is the operation of choice or, indeed, of necessity.

If the head becomes fixed at the brim, even though a large segment has not entered, the forceps operation is easier, though still a hazardous task.

If the head becomes well engaged in the pelvic brim, the task becomes much simpler and the forceps operation is always to be given the preference. Even in this case, however, and for reasons not always easy to determine, perhaps unusual size or shape of the fetal head, or some obstruction in the excavation or at the outlet, progress is impossible. In this case the attendant should remember that version is sometimes easily accomplished when its accomplishment is least expected. This has been discussed in the chapter on version.

The reader will see that the choice between the two operations is not always an easy one, but, if he will consider carefully the general principles involved, he need seldom go seriously astray.

One thing is plain. A cautious, skilful, and tentative resort to the forceps does no great harm and does not preclude the subsequent performance of version or pubiotomy, while a version half completed leaves the operator in a most unenviable position and of necessity sacrifices the child.

Technic of the Forceps Operation.—If the head is above the brim and cannot be made to engage by external pressure, this is ordinarily contraindicated, though in good hands the operation is occasionally successful. When a fairly large segment has become fixed at the brim the prospects are better.

If the head is high, it will be found to occupy one of two positions. In flat pelvis it is transverse and but little flexed, while in the generally contracted pelvis it is oblique and strongly flexed. Let us consider the first instance.

As we have noted in the chapter on the forceps operation, the application of the forceps to the sides of the head above the brim is impracticable, even when the pelvis is normal. It is plain that in pelvic flattening the difficulty is much increased. The forceps, then, are applied obliquely. There is in these cases a marked tendency for the forceps to slip backward over the occiput. The French accoucheurs seek to avoid this by intentionally directing the curve of the forceps toward the face. The *modus operandi* is made plain by the accompanying illustration from Jeannin (Fig. 320).

The blades penetrate more deeply than is usually the case. Short and weak forceps are of little value in these cases. It may be necessary to carry the handles far backward against the perineum to secure locking.

If the old model is used, tractions are at first made directly downward; *i.e.,* as nearly downward as they can be made by the use of Pajot's manœuvre. This can be materially aided by the use of tapes. The axis-traction model, however, is much to be preferred. With this the head takes the proper direction automatically. I have seen success with the Tarnier instrument after failure with the Elliott forceps in the hands of an unusually skilful operator.

It is the experience of the French writers, who have carried the technic of the forceps operation to a very high degree of perfection, that Tarnier's older model, which is provided with a perineal curve, works best in these cases, securing a firmer and more secure grasp of the fetal head. This model is known to us in New York as "Lusk's modification," and is now seldom used here. It would seem, however, that it should at least be at hand in hospitals.

The application of the forceps when the head is high and strongly flexed, as in general contraction, does not differ from that in the ordinary high forceps operation except that it is more difficult. Moreover, the difficulty does not necessarily decrease with the passage of the brim, since these pelves are often of the funnel type.

In outlet contractions, *e.g.*, in kyphotic pelves, the head has usually rotated or nearly rotated and there is no difficulty in making a good application to the sides of the head. A forceps with a very moderate pelvic curve is to be preferred. The handles should not be raised too early, since during the final extension of the head the occiput is applied, not to the pubic arch, but to the intertuberal line. The method of delivery resembles that necessary in posterior positions of the occiput. Indeed, in outlet

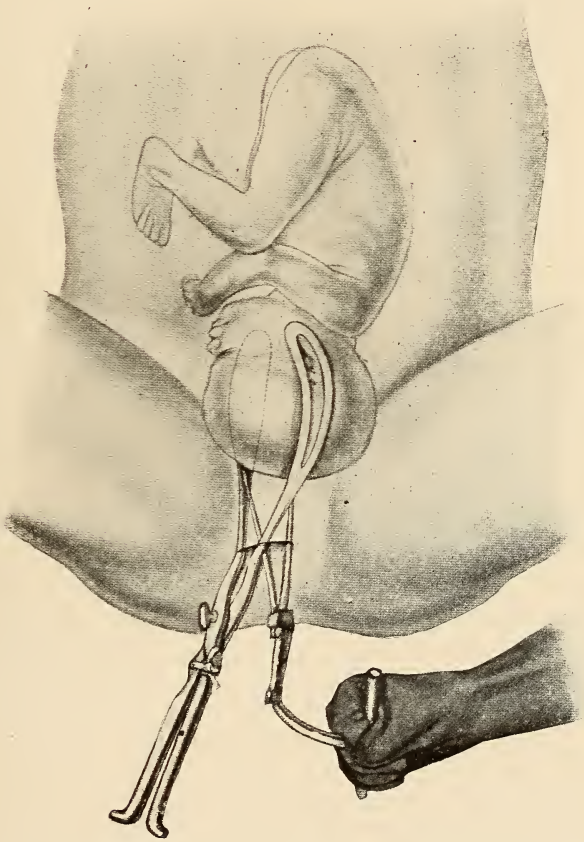


FIG. 320.—Oblique application of forceps above the brim, head in L. O. T. position.

contraction a posterior position is not a disadvantage and no effort should be made to correct it. It is difficult to bring the wide biparietal diameter through the narrow pubic arch. When difficulty is experienced in the extraction of the head moderate lateral movements ("pendulum movements") of the forceps are very useful.

The employment of the forceps in pelvic contraction has been severely censured. When this censure is directed against their unskilful use, and

in particular against persistent and senseless efforts to overcome obstacles by force, it is fully justified. The cautious and tentative use of the forceps in good hands as a means of diagnosis is quite a different matter. If a few tractions result in no advance or prospect of advance, and in particular if there is great difficulty in locking the instrument, it is wise to desist and to resort to some other method of delivery.

Technic of Version in Pelvic Contraction.—In these cases version often proves very difficult. The necessary manipulations are hindered by lack of room. Sometimes both the intrapelvic and the intra-abdominal spaces are diminished. It may be difficult to reach a knee or a foot, and it may be difficult to turn the child even after a foot has been grasped. In the latter case it is advisable to bring down the second foot also, if this can be done, and to make traction upon both feet. In the former, one may succeed by turning the patient in the lateral position. Bringing down the posterior arm is an arduous task, and may require the introduction of the entire hand into the vagina, a procedure which is likely to result in severe laceration.

The delivery of the after-coming head may prove extremely difficult, and for this reason the services of a competent assistant should be secured if possible. The manœuvre of Champetier de Ribes is very useful. The French accoucheurs have considered oscillating tractions of great value in the delivery of the after-coming head. In this country they were taught by Goodell many years ago. The trunk is alternately raised and lowered, a finger in the mouth keeping the head flexed. It is more effective, however, to make the tractions on the shoulders alternately, an assistant making suprapubic pressure upon the frontal region, thus keeping the head flexed. If the child dies, tractions should be suspended and the after-coming head perforated. There is neither sense nor science in imperiling the mother in order to avoid a slight mutilation of a dead child.

Prophylactic Version.—This method was formerly much employed. It consists in performing version and bringing down a foot early in labor. The foot serves, if necessary, as a handle in the subsequent delivery. The procedure is convenient and attractive and saves the attendant much anxiety. It is a great relief to him to know that he can terminate labor at any time, and furthermore version may be much easier early in labor than later.

It has been urged, too, in its favor that rapid delivery is better for the mother than a greatly prolonged labor supplemented perhaps by a forceps operation. The extraction of the after-coming head may, it is true, be difficult and may be attended by severe laceration, but the long-continued pressure, with its train of evil consequences, sloughing, sepsis, etc., and the great attendant suffering is absent. The objection to this method is that it leaves the child largely out of account. A high proportion of children succumb to version in contracted pelvis and, as we know, many of these cases terminate happily if left to nature. It is evident that by this method

the fetal mortality will be considerably increased. It was a useful resource in the days when the Cæsarean section was almost necessarily fatal, but should now be restricted to cases in which the circumstances are decidedly unfavorable to abdominal section, or the existence of some malpresentations, *e.g.*, face or brow presentation, or posterior occiput, which render vertex delivery unlikely.

The engagement of the head in the pelvic brim is sometimes favored by placing the patient in the Walcher position. In this position the hips are brought so far over the edge of the bed or table that the weight of the legs and thighs dragging directly downward (toward the floor) carries the symphysis in the same direction and thus temporarily increases the antero-posterior diameter of the brim. The space gained is small, one to eight millimetres, according to Pinzani, and few patients can be induced to maintain it for a long time, but in doubtful cases it is worth trying. An improvement upon the ordinary method is that of Hirst, who puts a thick cushion under the patient's back, meanwhile allowing her to remain in bed (Fig. 321).

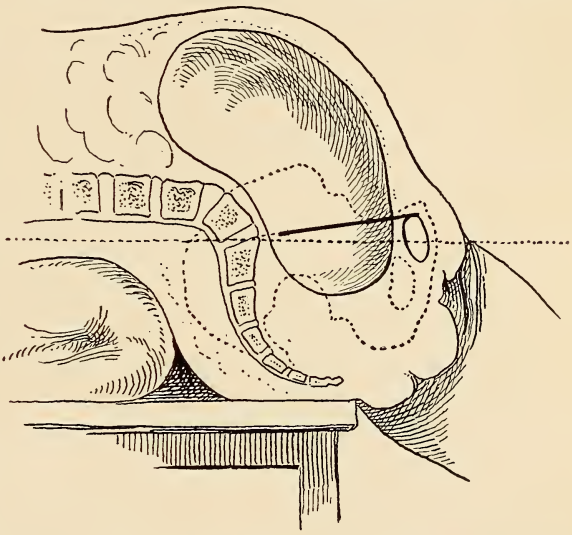


Fig. 321.—Walcher posture. Black line denotes conjugate diameter of the brim. Space gained is a dotted continuation of this line.

In some cases the entrance of the head into the pelvic brim may be aided by strong pressure applied directly to the head through the abdominal wall, after the method of Hofmeier. The bladder must be empty and an anæsthetic will usually be necessary. It is evident that too great force or undue persistence in the effort may be productive of harm.

But the reader must carefully avoid the idea that every case of pelvic contraction requires operative treatment. In some, indeed, there is little or no deviation from the mechanism or clinical course of labor. Now and then, much to the surprise of all concerned, labor runs an unusually rapid course.

In the majority of cases, however, labor is prolonged to a greater or less degree and the delay, together with the attendant suffering, requires the solicitous attention of the physician. We have already spoken of the importance of asepsis, of the limitation of examinations, and of the preservation of the membranes. But the danger of infection, while perhaps

the greatest, is not the only danger. The ill effects of exhaustion and shock are not to be forgotten. The suffering is often exceptionally severe. Sometimes the patient undergoes a veritable martyrdom. When progress is arrested or becomes very slow the long continued reciprocal pressure between the head and the maternal circle of contact is attended by pain which, as Lusk was wont to say, exceeds that of the rack or the thumb screw. Recalling these facts, the thoughtful and humane attendant will not forget to see that his patient receives suitable nourishment and perhaps stimulation, and will endeavor to procure for her sleep, and as far as possible relief of pain. This is best accomplished in the first stage by moderate doses of morphine or chloral or both combined, and in the second by the occasional inhalation of ether by the drop method. The "twilight," method, which undoubtedly prolongs the second stage of labor, is not to be advised in these cases.

A pendulous abdomen, so common in pelvic contraction, is sometimes a very effectual obstacle to the progress of labor. This should be corrected by a bandage so arranged as to lift the fundus to its normal position and bring the uterine axis into coincidence with that of the pelvic brim.

DeLee prefers the exaggerated lithotomy position. An assistant should keep the thighs firmly pressed upon the abdomen. Theoretically this position would seem to be contra-indicated, since it is supposed to widen the pelvic outlet rather than the inlet, but in these matters theoretical conclusions should not be allowed to stand in the way. It is certainly a very effectual way of correcting a pendulous abdomen, and, since it imposes no great strain upon the mother, is well worthy of trial.

Two or three careful examinations at intervals of an hour or two will suffice to show whether progress is being made. The examiner recalling the mechanism of labor in pelvic contraction will note that in flat pelvis the approach of the sagittal suture to the median line and, in general contraction, the descent of the posterior fontanelle, are favorable signs.

The fetal heart should be carefully watched during the second stage and since the low operation imposes no serious additional risk to the mother the attendant will not hesitate to hasten delivery if it seems necessary in the interests of the child.

If the head becomes impacted (wedged) in the pelvis in such a manner that it is apparent that a general "loosening" of the pelvic diameters is all that is necessary, if child is viable and if conditions, *e.g.,* repeated examinations, etc., forbid Cæsarean section, we have the typical indications for pubiotomy. But this indication is rarely present. Personally, I agree with Hirst that, as our results in the Cæsarean section steadily improve, this operation will be for the most part abandoned, as has been the case with symphysiotomy.

Before being subjected to pubiotomy, however, the patient is entitled to a trial of the axis-traction forceps in the hands of a good operator, if such can be secured. If the conditions are not favorable to the performance of

the Cæsarean section or pubiotomy, the choice lies between the forceps operation and version. The relative indications are much the same as those already stated.

If the child is dead or positively non-viable, craniotomy may be performed. It is a popular mistake, however, to suppose that craniotomy is necessarily safer than the Cæsarean section. If the head is larger than we suppose, and this is often the case, and particularly if the measurements approach the lower limit, it may prove an exceedingly difficult operation, requiring much skill and experience in obstetric manipulation. Under

FIG. 322.—The anterior and posterior sagittal diameters at the outlet. (Polak's Manual of Obstetrics, D. Appleton & Co.)

these circumstances craniotomy, by a man unskilled in obstetric operating, is far more dangerous than the Cæsarean section performed by a man who has a fair knowledge of abdominal surgery.

The conduct of the second stage, if the patient is so fortunate as to reach the second stage without operative aid, does not differ materially from that which obtains in normal labor except that the fetal heart must be most carefully watched. Recalling the fact that the fœtus has been subjected to long and severe pressure the attendant, if he finds any indications of impending asphyxia, will not delay the application of the forceps.

If, however, the disproportion is too great, the pains become intolerably

severe, assuming a character familiar to the experienced obstetrician. This is doubtless due to reciprocal pressure between the head and the pelvic brim unattended by advance. There is no respite between the pains, as in normal labor. The continued pressure causes congestion and œdema of the vagina and vulva. The anterior lip of the cervix becomes enormously swollen and in rare cases the entire cervical ring may slough off and be discharged. If relief is not afforded the case goes on from bad to worse and the patient eventually dies from rupture of the uterus, sepsis, or exhaustion. Happily this picture is no longer seen.

Treatment of Outlet Contractions.—When the transverse diameter of the outlet is much diminished (according to Williams when it is less than eight centimetres) the occiput is arrested between the tuberosities and consequently the available space anteroposteriorly is represented by a line extending from the middle of the intertuberal diameter to the tip of the sacrum. This line represents what is called the posterior sagittal diameter (Fig. 322).

It is obvious that if the transverse diameter is seriously diminished the posterior sagittal diameter must be proportionately increased, or labor will be delayed or perhaps completely arrested. Williams gives the following as showing the necessary proportions:

Transverse diameter 8	cm.,	posterior sagittal	7.5 cm.
Transverse diameter 7	cm.,	posterior sagittal	8 cm.
Transverse diameter 6.5	cm.,	posterior sagittal	8.5 cm.
Transverse diameter 6	cm.,	posterior sagittal	9 cm.
Transverse diameter 5.5	cm.,	posterior sagittal	10 cm.

These figures are subject to considerable variation, the size of the head being an important factor, and in cases of doubt I am inclined to favor a careful trial of the forceps. In some apparently formidable cases nothing more serious results than a perineal tear. When the disproportion is too great, the Cæsarean section should be performed; or if the conditions are not favorable for this operation we may resort to pubiotomy. The technic of the forceps operation in outlet contractions is given later.

It is said that the posterior sagittal diameter is increased by putting the patient in the semi-prone position and this expedient is well worth trial.

PART III

OBSTETRIC SURGERY

CHAPTER XXIV

GENERAL TECHNIC OF OBSTETRIC OPERATIONS

General Remarks. The Improvised Operating Table. Position of Patient. Asepsis and Antisepsis. Postoperative Precautions.

Obstetric surgery differs from other kinds of surgery in the fact that its operations are for the most part operations of emergency. They do not admit of delay.

In general surgery and gynæcology the operator usually has time for preparation. He has a few days, or at all events a few hours, for reflection and study. He can appoint a time and a place for his operation, and in the meantime secure such advice and assistance as he may deem necessary. He can operate at the home of the patient or, if he so elects, can have her transferred to a hospital.

How different it is in the practice of obstetrics we all know. The obstetrician has scant time for preparation or consultation. For some occult reason these operations must usually be performed in the middle of the night or in the early hours of the morning, when the operator, perhaps new to his work, is worn out by anxiety and loss of sleep. In many cases he must forego the advantages of professional assistance and skilled nursing, working with such assistance as he can command, performing the operation and supervising the anæsthesia at the same time, and all this in the presence of an excited and none too friendly audience.

All this is calculated to embarrass and unnerve even those who are no longer novices and it is therefore desirable that every one who may be called upon to perform these operations should have a plan of campaign marked out in advance, and that he should so thoroughly master it, by memorizing its details, and by putting it into practice whenever opportunity offers, that it will become part of himself, and that, even amid the most trying surroundings and under the most unfavorable circumstances, he will, as it were, automatically, do the right thing at the right time.

Here, as elsewhere, individual preference and opinions will vary, and every man who does much obstetric work will in time develop a technic of his own. The following suggestions, which are the result of considerable experience in this field, may serve as a frame-work to which the practitioner may add as experience or judgment dictates. But first a word as to indications.

The indications for the different operations will be given as we go on. There are a few rules, however, which apply to obstetric operations in general.

In the first place a clear indication should be present. To operate in order to save time is never justifiable. If a man cannot afford the time necessary to do justice to his patient, he should adopt a less arduous calling than that of the obstetrician.

In doubtful cases the inexperienced obstetrician will usually do better to wait for a time, provided the condition of mother and child is good and suffering not excessive.

On the other hand, if an operation is distinctly indicated the sooner it is performed the better. There are certain cases in which delay is perilous. For example, in transverse positions version is usually easy if performed early, but if delayed may prove difficult or even impossible. In placenta prævia delay may be fatal. In prolapse of the cord, or impending asphyxia of the fœtus, prompt action is necessary, and so on.

Before the administration of the anæsthetic is begun the operator should satisfy himself that he has at hand all the instruments, appliances and drugs that may be needed during, or immediately after, the operation. These should include a hypodermic syringe in working order with tablets of morphine, strychnine, etc., and above all some reliable preparation of ergot for hypodermic use. A fountain syringe and an intra-uterine douche tube, together with plenty of hot sterile water to be used in case of hemorrhage, also plenty of sterile gauze for packing the uterus, a tenaculum for drawing down a torn and bleeding cervix, needles and suture material. The latter should include silkworm gut and catgut. Time and trouble are saved by having a few needles threaded in advance. Sterile towels, absorbent cotton for sponges, and an abundant supply of lysol solution should also be at hand. Everything requisite for combating fetal asphyxia should be in readiness, including a tracheal catheter, preferably of metal, and oxygen if obtainable.

It is most annoying to the operator, and, what is more important, detrimental to the interests of the patient, for him to be obliged to suspend an operation and to prolong the anæsthesia while searching for some necessary instrument, threading needles, or sending for assistance.

When an obstetrical operation is begun it is usually best to finish it at one sitting. Of course, there are exceptions to this rule. If a man attempts an operation and finds that its successful completion is beyond his power, he should at once desist from the attempt and send for such assistance as he may need. Again an operation may comprise two operative procedures, *e.g.,* a preliminary dilatation of the cervix. It is my experience that in such cases the first procedure is short and all usually goes well. On the whole, however, repeated attempts at delivery are not only demoralizing to the physician and to the family but they materially prejudice the interests of the patient. Repeated anæsthesias and attempts

at delivery with the necessary attendant manipulations rapidly exhaust the vitality of the patient and markedly increase the danger of hemorrhage, infection and shock, especially the latter.

Let me repeat, then, that the young obstetrician will do well, before undertaking serious or doubtful obstetrical operations, to make sure, if possible, that everything that may be needed is at hand, not forgetting experienced advice if the circumstances will permit. The latter will not only aid him in promptly and successfully completing his work, but will afford him the moral support that is so necessary in the trying emergencies of early obstetrical practice.

The Operating Table.—Obstetrical operations should be performed upon a table. It is quite true that the simpler operations, *e.g.*, the low forceps operation, are often successfully completed in the cross-bed position, but he who always uses the table will in the end obtain better results and may now and then escape serious misfortune.

The importance of obstetric surgery should not be underestimated. No one would think of trying to do an appendectomy or a herniotomy with the patient in bed and the operator kneeling on the floor. The operations which the obstetrician is called upon to perform are of at least equal difficulty, and they involve a more serious responsibility, since two lives are at stake.

Then, too, the practice of obstetrics is full of surprises. The unexpected difficulties of forceps operations are discussed elsewhere. Such difficulties often arise during the operation of version. It is always demoralizing, and sometimes dangerous, to stop in the midst of an operation to change the position of the patient. Moreover, however simple the operation, it may be necessary to follow it by the repair of an extensive laceration, or by packing the uterus for hemorrhage.

Last, but most important of all, the patient and her friends have a right to expect that operative procedures such as these should not be performed under such circumstances that delicacy of manipulation and thorough asepsis are alike impossible.

In the hospital, of course, a special operating table is always at hand, but such a table is by no means a necessity. Almost any table that is strong enough to hold the patient will do. I have many times operated upon the dining-room table, and, indeed, I have found this more convenient than the usual surgical table in most hospitals, which is altogether too high for the upward traction necessary in forceps operations.

The table should be placed in a convenient light and covered with a blanket. Over this should be placed a sterile sheet or at least one fresh from the laundry. Underneath the buttocks of the patient may be placed a piece of rubber sheeting, or, in an emergency, white oilcloth, so arranged as to convey the discharges into a pail at the foot of the table and at the same time prevent them from flowing backward toward its head. I have learned to dispense with the Kelly pad. While very convenient for curet-

tage and other gynæcological procedures, it is quite unsuited to such operations as forceps and version, and is almost certain to be pulled from under the patient during the strenuous work so often necessary (Fig. 323).

FIG. 323.—Improvised operating table in private house. The imitation Kelly pad is made of white oilcloth. It should be covered with a sterile sheet before the patient is placed upon the table. The wash boiler in which the instruments have been boiled and from which they have been removed contains plenty of sterile water. The bowl on the chair contains lysol solution and sponges. Note among other things the rubber catheter on the table and the fountain syringe hanging on the wall; both absolute necessities.

I have also learned to dispense with legholders, considered so important by many, and always prefer to secure, if possible, the services of two

lay assistants, one to hold each knee. In this way the patient can be perfectly controlled, a matter of great importance, since, as we shall see presently, profound and long-continued anæsthesia is highly undesirable. An additional advantage is that the legs and thighs can be flexed and extended at will and the position of the patient changed if necessary. As we have seen elsewhere, extension of the thighs during the stage of expulsion favors relaxation of the perineum. Then, too, in difficult version it may be desirable to turn the patient upon her side. An additional disadvantage of legholders, straps, etc., is, that the constriction of the legs by such apparatus may cause considerable pain and soreness, lasting for days after the operation. The assistants who hold the legs must, of course, be cautioned against coming in contact with the field of operation.

In an emergency the legs may be held by a twisted sheet, but such an arrangement is very frail and unsatisfactory, and every physician should carry with him an appliance like that of Robb. This may be removed when the head begins to distend the perineum (Fig. 324).

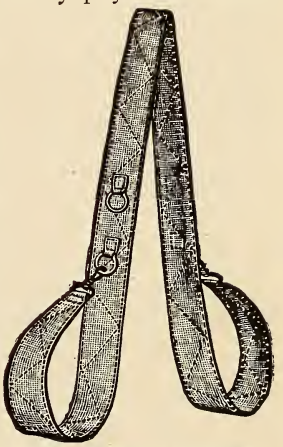


Fig. 324.—Robb's legholder.

The operator should avoid touching anything that is not sterile, and, since in certain cases, *e.g.,* in version, it is absolutely necessary that he should make certain manipulations through the abdominal wall, the abdomen should at all times be covered with a sterile towel. Other sterile coverings are used as directed in the chapter on the management of normal labor. Let the operator remember that wherever water can be boiled, there sterile dressings can be obtained. Trained nurses and hospital paraphernalia are very desirable, but not absolutely indispensable. Now and then one meets a man who imagines that unless the patient is in a hospital or a good home it is useless to take any precautions at all. This is very far from the truth, and to proclaim such ideas is most reprehensible.

Anæsthesia.—The general subject of anæsthesia in obstetrics is discussed elsewhere. It cannot be too often repeated, however, that in obstetric surgery the amount of anæsthetic administered should be strictly limited to the absolute necessities of the particular case. The attendant should never for a moment forget that in obstetrics there exist objections to any excess in this respect that do not obtain in other branches of surgery. In the latter the physician does not have to contend with the dangers of postpartum hemorrhage, fetal asphyxia, and preëclamptic toxæmia. The influence of prolonged anæsthesia, and especially of too much chloroform, in causing or aggravating these conditions has already been noted. The administration of the anæsthetic should be delayed until the last moment, *i.e.,* until the patient is on the table and the operator is ready to

begin (Figs. 325, 326 and 327). Very often it takes but a moment to anæsthetize a woman who has been long in labor. Now and then I have seen an operator consume fifteen or twenty minutes in preparations that should have been made before, the patient meanwhile being profoundly narcotized. This is closely akin to malpractice. The attendant should

FIG. 325.—Patient upon the table. A twisted sheet keeps the thighs flexed upon the abdomen.

be content with primary anæsthesia whenever this will suffice, and should discontinue the anæsthetic as soon as possible. Ether should be preferred in all cases in which the patient has lost, or is likely to lose, much blood, *e.g.,* in placenta prævia and in certain cases of abortion. It should also be used in all anæmic or exhausted cases, *e.g.,* in the induction of abortion for pernicious vomiting. Owing to the danger of delayed chloroform

Fig. 326.

Fig. 327.

Fig. 326.—Doctor's operating gown, cap, mask and gloves.
Fig. 327.—Nurse's operating gown, cap, mask and gloves.

poisoning, chloroform should not be used in operations lasting more than twenty or thirty minutes. If an anæsthetic must be used after delivery, *e.g.,* in perineorrhaphy or manual removal of the placenta, ether is to be

preferred. Nitrous oxide should not be used before delivery without a plentiful supply of oxygen, as it rapidly asphyxiates the fœtus. My experiments in the administration of oxygen to pregnant women at the New York City Hospital indicate that it directly affects the fœtus, and experience leads me to believe that the chances of the fœtus are improved by freely combining oxygen with whatever anæsthetic is used in obstetric operations.

Position of the Patient.—What position should the patient occupy during the operation? Usually the dorsal, since in this position the anatomical relations are more easily remembered and asepsis is more easily maintained. It is obvious that one cannot practise irrigation satisfactorily with the patient in the Sims position and the rectum on a higher level than the vagina.

Nevertheless, there are exceptions to this rule, *e.g.,* when it is proposed to introduce a tight vaginal tampon. As explained elsewhere, this can be more effectively done with the patient in the Sims position. Then, too, we shall see when we come to consider particular operations, that in using the axis-traction forceps and in the performance of version it is sometimes of great advantage to turn the patient upon her side.

Nothing could be more provincial than to adopt some one position, because customary or traditional in a particular locality, and never deviate from it.

The Bowels.—In obstetric operations there is usually no time to empty the upper bowel. One cannot wait for the action of a cathartic. But it is always wise to give an enema if circumstances permit. A pint of soapsuds with a drachm of turpentine works promptly and efficiently. A loaded rectum interferes, if not greatly at least to some extent, with the contraction of the uterus and the descent of the head, and during the emergence of the latter fæces are extruded, soiling the adjacent parts and increasing the danger of infection.

The Bladder.—Much more important is it to empty the bladder. The catheter should never be left at home. Barnes, the well-known English obstetrician, was wont to advise his students to have a catheter tied to the forceps that they might not forget to empty the bladder before using the instrument. We may not follow this advice literally, but we should not forget the principle involved, one of the most important in obstetrics. Before every important obstetrical operation, whether it be the forceps operation, version, breech extraction, the Cæsarean section, or craniotomy, the bladder should be carefully emptied as the final step in preparation. Sometimes, indeed, this is all that is needed. I recall a case in which I was called upon to operate, the delay being attributed to pelvic contraction. A superficial examination at once disclosed the cause of delay. The bladder was enormously distended. The only instrument necessary was the catheter.

The glass catheter is here an absurdity. It may break, and it often fails to reach the bladder. A long, soft, rubber instrument which has

been sterilized by boiling should always be at hand and should be introduced to its full length. It is occasionally, though not often, necessary to elevate the hips and push the head up a little in order that the instrument may pass without difficulty between the head and the symphysis.

Asepsis and Antisepsis.—This subject we have already considered, but an additional word of caution is necessary. The operator must not forget the disinfection of the patient. If a competent trained nurse is present she will attend to this matter, but if not, the physician must attend to it himself.

Here it is well to observe a definite order of procedure. Before touching the patient at all the operator disinfects his hands according to the methods already described, in order that he may not infect his patient during the process. Then, lest he may have contaminated his hands he redisinfects them and is ready to proceed. This double disinfection requires extra time, but it is time well spent and the operator can proceed with a clear conscience. This conduces not a little to his peace of mind and thus indirectly to the success of the operation.

The preliminary disinfection of the patient should never be omitted. It consists in a thorough cleansing and scrubbing of the external genitals and also of those adjacent parts of the body, the abdomen and the thighs, with which the hands are almost certain to come in contact at some stage of the operation, first with soap and water and then with lysol solution. Cotton sponges are to be preferred to a stiff brush as effecting the same object with less traumatism. The hair about the vulva should be cut close with scissors. This is preferable to shaving the parts, which is not only unnecessary but objectionable as causing many scratches and abrasions of the epithelium, which may become the site of infection.

Experience long ago convinced me that preliminary douching or scrubbing of the vagina is not necessary. In fact, I believe that it does harm rather than good, by diluting or washing away the protective secretions furnished by nature. Rubber gloves should be worn, especially after exposure to contagious diseases or infectious cases, and should always be carried by the practitioner to be used in those rare cases in which some great emergency, *e.g.,* severe hemorrhage, renders it impossible for him to take as much time as he would like to take in the process of hand disinfection. For such emergencies and for all cases in which the hand must be introduced into the uterus, gloves are indispensable. Those of the gauntlet variety are preferable.

During the course of the operation the vulva and adjacent parts, especially the anal region, should be irrigated frequently from before backward with lysol solution. Some writers advise that the anus be covered with a sterile towel held in place by adhesive plaster. This works well in curettage, the repair of a torn cervix, and other semi-gynæcological operations, but during delivery, whether normal or operative, fæces are pressed from the rectum and the presence of the towel merely results in smearing them

over the surrounding parts and markedly increasing the danger of infection by the colon bacillus.

It is the custom with some operators to wash out the uterus after all operations in which the hand or instruments are introduced into its cavity. I long ago abandoned this practice and have had no reason to regret it. I believe that it is, to say the least, unnecessary. Careful asepsis during the operation and strict external cleanliness following it give the best results.

Final Examination.—When at length the patient is clean, anæsthetized, catheterized and in position upon the improvised operating table, there remains one further preliminary which should never be forgotten. The final examination for diagnosis. The failure to make such an examination is to be regarded as a serious error. Previous examinations have perhaps been unsatisfactory. Sutures and fontanelles may have been difficult of access or obscured by the presence of a large caput succedaneum. Thorough exploration may have been prevented by the resistance of the patient or by a commendable desire upon the part of the attendant to avoid the infliction of annoyance and unnecessary pain. But now with the patient mercifully unconscious of suffering, the muscles of the abdomen and pelvic floor relaxed, and the rectum and bladder empty, the half-hand, if necessary, may be introduced into the vagina and the exact condition of affairs determined. Grave consequences have often resulted from neglect of this examination. The most common mistake in my experience is the failure to recognize a posterior position of the occiput. If under these circumstances the forceps are applied without reference to the position of the head and an attempt made to overcome obstacles by force, the results may be disastrous for both mother and child. Many other mistakes which might result will at once occur to the reader; *e.g.*, the failure to recognize moderate, or even marked, pelvic contraction.

Attention to the Fœtus.—Obstetric operations differ from other operations in many ways, but in none, I think, more than in the fact that the operator is responsible for two patients at one and the same time. This is too often forgotten. Before every operation the fetal heart should be auscultated. If it cannot be heard, or if for any other reason the operator is apprehensive as to the safety of the child, he should inform some responsible member of the family. In this way he may escape undeserved criticism. At frequent intervals during the operation auscultation should be repeated and both in study and practice the physician and student should pay special attention to those points in the technic of obstetric procedures as relate to the fœtus. These are considered in connection with the different operations. Time devoted to this subject is well spent.

When the operation is over the attendant should never forget to determine the existence of lacerations and to make any needed repairs. In his joy at a successful result or his anxiety as to final outcome he should not forget to see that his patient is properly cleansed and left in an aseptic

condition. The neglect of this precaution may undo all the good that has been accomplished. The cleaning up process, however, should be conducted with as little disturbance as possible.

Perineal tears should be repaired at once if the patient's condition permits and the attendant circumstances are favorable. As we have noted above, this may not always be advisable after prolonged and severe operations, but in such cases repair should be postponed until the next day—not omitted. Tears of the cervix sufficiently extensive to cause noticeable hemorrhage should, of course, be repaired at once. Such tears should always be thought of and sought for after high or median forceps operations, versions, and the induction of labor.

Some recent writers advise that after all obstetric operations the interior of the uterus be palpated lest a rupture be overlooked. This seems to me a flagrant instance of meddlesome midwifery, the general adoption of which would do more harm than good.

Before leaving the patient, the attendant should note carefully her facial appearance and general condition and the degree of uterine contraction.

After all, except the easiest, operations the patient should remain absolutely quiet in the dorsal position and with the head low for at least twenty or thirty minutes. Nor should she be removed to her bed until the attendant is satisfied that there is no immediate danger of hemorrhage. During her removal from the table to the bed the head should still be kept low and no voluntary effort on her part should be permitted. It is highly desirable that the patient be carefully watched for at least two hours after delivery. Before leaving the patient the attendant should make careful note of her facial appearance and general condition and of the degree of uterine contraction.

CHAPTER XXV

PROCEDURES DESIGNED TO OVERCOME THE RESISTANCE OF THE CERVIX

Manual and Instrumental Dilatation of the Cervix. The Vaginal Cæsarean Section. Incision of the Cervix. The Tampon. Sponge Tents. The Fœtus as a Dilator

Artificial Dilatation of the Cervix

When the cervix is undilated or only partly dilated and some emergency arises which seriously threatens the welfare of mother and child and makes delivery advisable, artificial dilatation of the cervix may become necessary. Those who do much obstetrical work will frequently have occasion to practise such dilatation and will do well carefully to consider the principles that underly this procedure, the conditions that justify it, and the technic of its performance.

Varieties.—Generally speaking, there are two methods of dilating the cervix artificially—manual and instrumental. In the first case, dilatation is effected by the hand of the operator and by this alone. In the second, various instruments and appliances of rubber, steel and gauze are employed. Let us first consider the simpler method of manual dilatation.

Indications.—Any condition in which prompt delivery is indicated may constitute an indication for manual dilatation. Typical examples of such an indication may arise in the course of eclampsia, placenta prævia, and prolapse of the cord. As we shall see later, it is a necessary preliminary to all forceps operations and to all versions, unless dilatation is already complete. It cannot be too often repeated that neither of these operations should be undertaken in the presence of an incompletely dilated cervix. A single, but important, exception is to be found in the case of placenta prævia, *q.v.*

Manual dilatation is a valuable adjuvant in the treatment of certain cases of delayed labor, and is sometimes employed to save time and prolonged manipulations when the cervix has already been partly dilated by bags or other instruments.

Contra-indications.—Manual dilatation should not be undertaken when the cervical canal is preserved in its entire length. The condition of the cervix is approximately that of the non-pregnant condition, or of early pregnancy. It has not as yet undergone the necessary physiological softening and partial obliteration that are part of the latter weeks of pregnancy and the early hours of labor. It is perfectly plain that such a cervix cannot be dilated manually except by the use of brute force—a process not

of stretching but of tearing. This is the so-called *accouchement forcé*, deservedly obsolete and far more dangerous than the Cæsarean section.

When the internal os has been effaced and the canal partly obliterated manual dilatation is possible, but should be undertaken only in exceptional cases, *e.g.*, a partial dilatation in placenta prævia with severe hemorrhage.

When the internal os has disappeared and the obliteration of the canal is complete, the conditions are more favorable.

The above remarks refer to patients at term. Manual dilatation of the cervix is often difficult in the seventh or eighth month, even when the canal has been taken up. In these cases the slower methods are usually to be preferred. Manual dilatation is essentially a procedure for patients at or near term.

Finally manual dilatation should never be practised simply to save time, but should be reserved for cases in which it is distinctly indicated.

Technic.—The bladder and the rectum should be empty. The operator should wear rubber gloves and every aseptic precaution should be observed.

Several methods are in vogue. That of Harris is perhaps the most popular and is, without doubt, the most convenient and effective. The

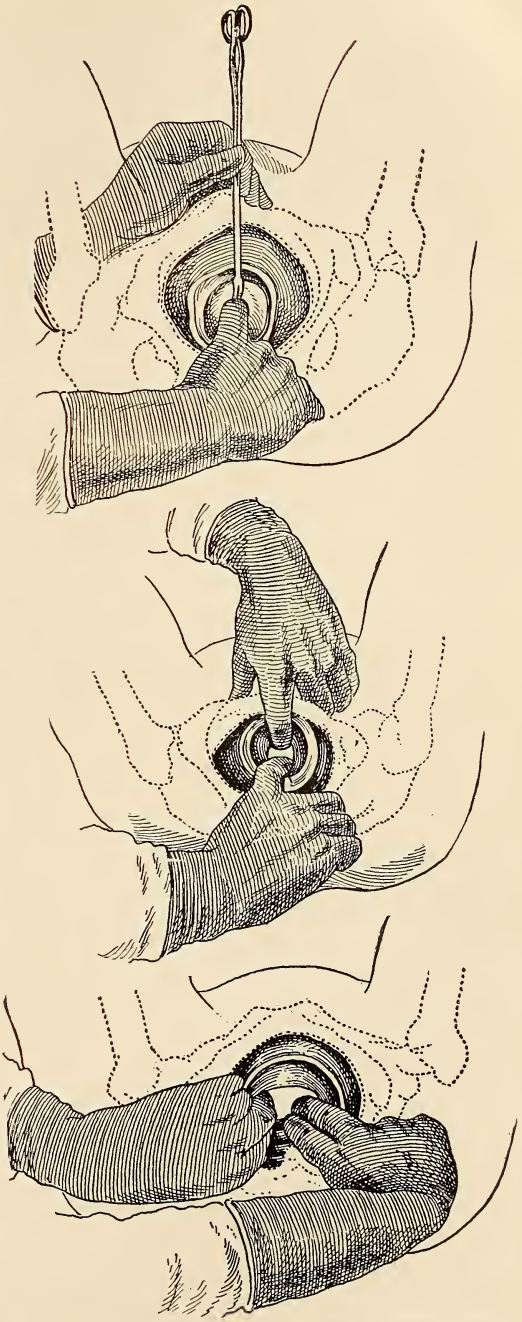


FIG. 328.—Bimanual dilatation of cervix. (After Edgar.)

hand is introduced into the vagina and the index finger passed through the cervix. The thumb is then inserted alongside the finger by a peculiar movement like snapping the finger slowly. The second, third and fourth fingers, and finally the thumb, are then introduced in a similar manner.

In the bimanual method practised in France by Bonnaire, in Scotland by Simpson, and popularized in this country by Edgar, both hands are opposing, pressure being made in various directions successively (Fig. 328).

Both these methods are capable of rendering excellent service, and may be used according to the circumstances of the particular case or alternately in the same case. Harris's method is much more convenient when the cervix is high and difficult to reach, but has one disadvantage, viz., that it is necessary to introduce the entire hand into the vagina, which is highly undesirable if the operator has a large hand and the vulval orifice is small, as in primiparæ. Edgar's method is more convenient when the cervix is low and easily reached, as it usually is in primiparæ, but the operator must guard against the temptation to use too much force or to proceed too rapidly.

In a comparatively large experience I have found it better to begin by simply hooking one finger into the cervix and drawing it down, making gentle but continuous pressure on different parts of the circumference of the resisting os. After a few moments a second finger can be introduced, and the process is repeated with two fingers, the fingers being at the same time separated so as to stretch the cervix successively in all its diameters. The operator should work slowly and carefully, taking 25 or 30 minutes by the clock, as Williams has well said. I have not usually found it necessary to introduce the hand into the vagina, nor to employ more force than can be exerted by separating the fingers.

If a contraction comes on while the operation is in progress all efforts at dilatation should be suspended until the contraction is over, the cervix meanwhile being allowed to contract upon the fingers. When four fingers can be introduced and separated, sufficient dilatation has been secured. The operator should not stop here, however, but should allow the cervix to contract for five minutes longer upon the separated fingers, thus not only dilating, but temporarily paralyzing it, and preventing its recontraction; *an artificially dilated cervix has a tendency to recontract.* This complete dilatation and paralysis of the cervical sphincter in manual dilatation is also the best method of preventing bad tears of the cervix during the subsequent delivery. Experience has taught me that such tears are not likely to result from any force that can be exerted by the mere separation of the fingers. They are usually caused by the rapid passage of the fetal head through a cervix that is but partially dilated.

In many, indeed in the majority of, cases in which manual dilatation is indicated, the cervix is already partly dilated and dilatation is easily completed by this method

All haste and the use of brute force should be avoided. The operator should remember that the effort at dilatation, properly performed, acts by tiring out not tearing apart the cervical sphincter.

A word of caution is necessary, however. Do not keep the patient continuously profoundly narcotized all this time. Primary anæsthesia is usually sufficient. When the dilatation is to be followed by operative delivery, as is so often the case, no one knows how long the entire procedure may last and the careful accoucheur is never unmindful of the dangers of prolonged and profound anæsthesia. Ether is usually to be preferred.

If the hand of the operator becomes cramped and disabled, as often happens, relief may be obtained by immersing it for a time in hot water, continuing the dilatation meanwhile with the other hand.

To Sum Up.—Manual dilatation of the cervix is one of the most important operative procedures in obstetrics. If it were more extensively taught and better understood many more serious operations might be avoided.

Manual dilatation can be safely practised only when the cervical canal is nearly or quite obliterated.

No more force should be used than can be exerted by separating the fingers.

Profound anæsthesia is not necessary and should be avoided.

If dilatation is to be followed by forceps or version it should be complete, and should be maintained for at least five minutes in order that the cervix may be temporarily paralyzed and recontraction prevented.

The introduction of the hand into the vagina is not usually necessary and should be avoided if possible. The half-hand is usually quite sufficient.

Whatever method is adopted, the operator should work slowly and gently, remembering that his purpose is to be effected, not to overcome obstacles by force, but by gradually tiring out the constricting cervical ring.

Instrumental Dilatation

Various instruments and appliances are used in dilating the cervix. Among these are the hydrostatic dilators—rubber bags filled with a weak antiseptic solution, the vaginal and cervicovaginal tampon, sponge tents, and certain steel dilators, of which we shall speak presently.

The bags of Barnes and de Ribes are shown in Figs. 329 and 330. The "dumbbell" bag of Barnes served a useful purpose in its day, but is now of historical interest only, having been superseded by the more useful and practical bag of de Ribes. The trouble with the Barnes bag was that it would not remain in position. It was constantly slipping out. The great advantage of the de Ribes bag is that, owing to its shape, it cannot slip out until the cervix has become dilated to the size of the greatest

diameter of the bag. A glance at Fig. 329 makes this perfectly plain. Further advantages of the de Ribes bag are that it serves perfectly the purpose of a dilating body, its shape resembling that of the "bag of waters," and its mode of action being a close imitation of the natural mechanism, and that, by the means of the tube attached, traction can be made and uterine action stimulated if necessary.

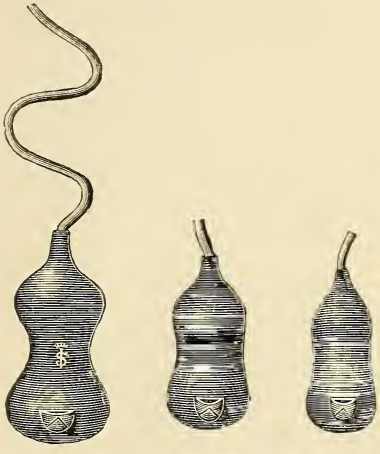


FIG. 329.—Barnes bags.

Voorhees's modification, which is essentially a de Ribes bag, so modified by using a thicker rubber, by substituting canvas for silk as a foundation, and by carefully sewing and cementing the seams as to render it much stronger and more durable, is extensively used and has proven very satisfactory.

Indications.—Hydrostatic dilatation is of use in a great variety of conditions in which we desire to induce labor or to hasten its progress. It is, in my opinion, the best method of inducing labor when the patient is near term and the cervix can be made to admit the finger. It is also useful in hastening the progress of labor when the presenting part is a poor dilator

FIG. 330.—Champetier de Ribes bag folded on itself.

of the cervix, as in "dry labor" and breech presentation, and it has been used to prevent the descent of the cord in cases of prolapse and to prevent or restrict hemorrhage in certain cases of placenta prævia. It is a favorite method of hastening cervical dilatation in eclampsia.

Many writers evidently regard the introduction of the bags as a

procedure only to be undertaken by one who has attained considerable technic. To my mind this is a mistake and has caused many a competent man to forego advantages that should have accrued to him and his patients. Certainly any man who is competent to undertake a forceps operation is competent to insert one of these bags.

Technic.—The patient should be in the dorsal position. The bladder should be empty. The preparation of patient and operator are the same in every detail as for the induction of abortion, already described. Rigid

FIG. 331.—Introduction of the de Ribes bag. An assistant is holding the cervix with two tenacula.

asepsis must be maintained. The bags will stand boiling several times, *and should be boiled.* Immersion in an antiseptic solution is not sufficient. The operator should remember that he is introducing a foreign body into the uterus and that this is always a serious matter. This is especially important in cases of low insertion of the placenta, in which all the manipulations are in the danger zone whence venous channels lead directly into the general circulation.

When all is ready, the cervix is exposed by means of an Edebohls speculum, and fixed by two tenacula. If the case is a suitable one for the

operation, little or no force will be necessary to pass the gloved finger through the cervix. In many cases two fingers may be passed. Cases in which the cervix is long and hard and the canal preserved—in other words, cases in which there must be considerable dilatation with the steel dilators before the tip of the finger can be introduced—are not, in my opinion, adapted to this method of delivery. In such cases some degree of preliminary softening and dilatation should be first attained by tamponing the cervix and lower uterine segment with gauze.

The operator now takes the bag in his hands, inverts its conical base, folds the bag upon itself, grasps it with the forceps, and passes it through the cervix under the guidance of the eye (Fig. 331). Withdrawing the forceps, he holds it in place with the finger and makes sure that the greatest diameter of the bag is well above the internal os. An assistant now fills the bag by injecting sterile water into the tube, or the operator may do this himself, as shown in Fig. 332. A piece of tape is now tied tightly about the tube to prevent the escape of the contained fluid. Some advise an artery-clamp for this purpose, but I have found that it is apt to cut through. Tape and tube, both sterile, are now coiled up and left in the vagina. The operator satisfies himself that the bag is well distended, places a sterile pad over the vulva, and awaits results.

The introduction of the bag is often a simpler matter than would appear from the above. In easy cases, *e.g.,* in the case of a primipara with the fetal head well down in the cavity of the pelvis and the cervix dilated to the extent of admitting one or two fingers, I have had no trouble in introducing the bag by the sense of touch alone, passing it through the cervix with two fingers and using no instruments whatever. It seems evident, however, that there is less danger of infection if the bag is passed directly from the sterilizer into the uterus, under the guidance of the eye.

Contractions usually come on within a few hours. The bag excites these rather by the reflex irritation due to its presence within the cervix than by any direct pressure which it exerts. If, however, the uterus is slow in responding, as it often is in toxæmic cases, traction may be made upon the tube. When the cervix has been dilated to such a size that the unruptured bag is expelled, a larger one may be inserted, provided labor is not well under way. Frequent renewals of the bag, however, involving repeated manipulations, and, in sensitive patients, repeated anæsthesias, are demoralizing and dangerous, vastly increasing the risk of infection, as well as destroying the confidence of the patient and her friends. If active labor does not supervene after the cervix has been dilated to the size of No. 3, a very gentle manual dilatation, followed by the rupture of the membranes, and perhaps by the exhibition of pituitrin, will almost certainly produce the desired result.

The action of the bag is made more rapid and certain if before its introduction the operator separates the membranes from the uterine wall with the finger passed through the internal os as high as he can reach. This

is not usually necessary, however, and in the absence of an urgent indication is obviously undesirable.

Steel Dilators.—Neither manual dilatation nor dilatation by rubber bags can be safely practised in early pregnancy. Even in the latter months, as long as the cervix is closed and its canal preserved, some preliminary dilatation must be secured before either of these procedures can be employed. In the last month of pregnancy, however, the cervix, especially in multiparæ, easily admits the finger and no preliminary dilatation is

FIG. 332.—The bag being in place the operator fills it with sterile water by means of the syringe.

required. Even though the cervix be closed, the tissues are usually soft and distensible and dilatation may easily be accomplished with the finger. Whenever the latter will serve the purpose it is to be preferred to any steel instrument. With the finger carefully used there is much less danger of laceration, and one can better estimate the amount of force employed.

Many operators advise and practise the use of steel dilators whenever the case is not suitable for dilatation by the finger. I would earnestly advise the reader against this practice. If time permits, and there are few cases in which it does not, it is far better to pack the cervix and vagina

with gauze and allow at least twelve hours for preliminary softening and dilatation of the cervical canal.

If the use of the steel dilators is deemed unavoidable, I prefer the graduated dilators of Hegar or Hanks as far safer than the branched or "glove stretcher" dilators in common use. The latter often produce severe laceration. There is no reason why we should not treat the cervix uteri with as much respect as we do the male urethra. If the branched dilators are used those of Goodell, in which the separated blades remain parallel to each other, are much safer than those ordinarily used.

This important subject is discussed at length in connection with the induction of abortion and of premature labor.

The Dilator of Bossi.—There is one steel instrument which is used not for preliminary but for complete cervical dilatation, the dilator of Bossi. True, there have been various modifications, but all embody the same principle. The parent instrument of Bossi has four arms, which are passed through the cervix and gradually separated by turning the screw at the handle. It is claimed that by means of this instrument complete dilatation can be attained in from fifteen to thirty minutes, even though the cervix be closed and its canal preserved.

I have never had occasion to use this instrument and I would say of its use as I said of the so-called *accouchement forcé,* and this method seems a sort of mechanical *accouchement forcé,* that when manual dilatation will succeed such an instrument is not necessary, and in the very rare cases in which immediate delivery *per vias naturales* is urgently indicated, the vaginal Cæsarean section is far safer. It is, indeed, true that the cervix may be dilated, or rather divulsed, by this instrument, but it is difficult to believe that such divulsion does not imperil the integrity of the maternal structures or that it does not leave the cervix in such a condition that the subsequent delivery involves extensive laceration.

There are certain methods of securing cervical dilatation which are neither manual nor, in the usual sense of the term, instrumental. They may be classified here under three heads: 1. The tampon. 2. The sponge tent. 3. The fœtus itself.

The Tampon.—Of these, and indeed, when time permits, of all methods, the tampon is by far the safest and therefore the best. Distention of the vagina excites uterine contractions and these produce a gradual softening and dilatation of the cervix, just as nature performs this task in abortion or premature labor. If the cervix and lower uterine segment are also tamponed the result is more prompt and certain, but the vaginal tampon is usually sufficient. The disadvantage of the tampon is that its employment requires more time. Its advantage is that the danger of severe cervical laceration is minimized. Questions of time or convenience should have no weight with the physician when the welfare of the patient is involved. The technic is given in connection with the induction to be presently described.

Sponge Tents.—When a piece of dried sponge, commonly called a sponge tent, is introduced into the cervix it imbibes fluid from the surrounding tissues and swells to a larger size. This dilates the cervix and reflexly excites uterine contractions. Dilatation by tents was formerly much in vogue and is still practised by some. It is difficult, however, to render a tent aseptic and it is unlikely that the tent will remain germ-free during the long process of imbibition. Moreover, various observers have reported cases of infection following the use of this agent, and we have in the cervicovaginal tampon a safe and effective recourse.

The Fœtus as a Dilator.—Finally, the fœtus itself may be used as a cervical dilator. For example, in abortions at the fifth or sixth month, before the period of viability of the child has been reached, a foot may protrude through the cervix, or the attendant may perform version and bring down a foot. Forcible dilatation is here out of place, since the mere presence of the thigh or half breech in the cervix is sure to cause ultimate relaxation. Should haste be necessary moderate, but not forcible, traction may hasten the process. Here, of course, the interest of the child does not come into question. Much harm is often done in the effort to hasten the delivery of a fœtus which could not possibly survive.

The same condition may arise in the course of version for placenta prævia, after the period of viability has been reached. Here, of course, the version is performed primarily to arrest hemorrhage, the question of dilatation being secondary. As we shall see later, rapid extraction is here especially dangerous to the mother.

The Vaginal Cæsarean Section

In 1906 the fertile and brilliant mind of Dührssen devised an operation popularly known as the vaginal Cæsarean section, but more correctly called anterior vaginal hysterotomy, designed for those cases in which some serious emergency demands the immediate emptying of the uterus in the shortest possible time.

First Step

The anterior lip of the cervix is seized and drawn down by the traction forceps or traction ligatures, one on either side of the median line. The ligatures are preferable as taking up less room than forceps and affording a more secure grasp. A third ligature in the posterior lip may prevent one of the anterior ones from cutting through.

A transverse incision about 6 centimetres in length is then made in the anterior *cul de sac* at the cervicovaginal junction. A sound in the bladder enables the operator to locate that organ and thus avoid injuring it. The beginner should always adopt this precaution (Fig. 333). The bladder is then pushed upward by means of the finger wrapped in sterile gauze, well above the internal os and held upward and forward by a broad speculum like that of Pryor. This freely exposes the cervix and lower uterine segment (Fig. 334).

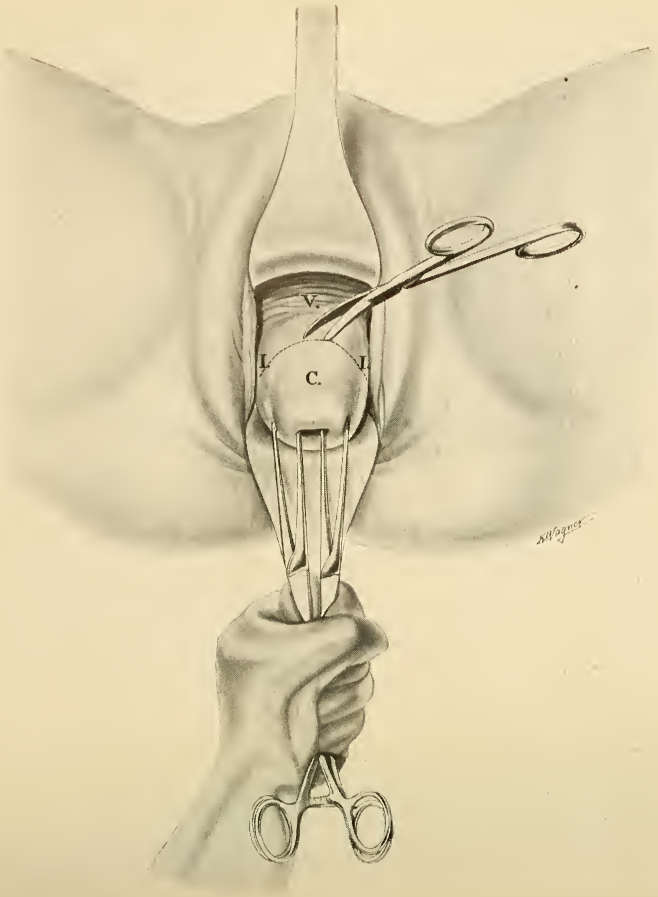


FIG 333.—Vaginal hysterotomy. Separating the cervical mucous membrane Preliminary incision.

FIG. 334.—Vaginal hysterotomy. Stripping the mucous membrane from the cervix.

SECOND STEP: THE UTERINE INCISION

While one assistant holds the bladder upward and forward, out of the way, by means of the speculum, and the other draws the cervix downward by traction ligatures or forceps, the operator, under the guidance of the finger passed within the cervix, makes an incision with a pair of strong, straight, blunt-pointed scissors. This incision divides the cervix and the

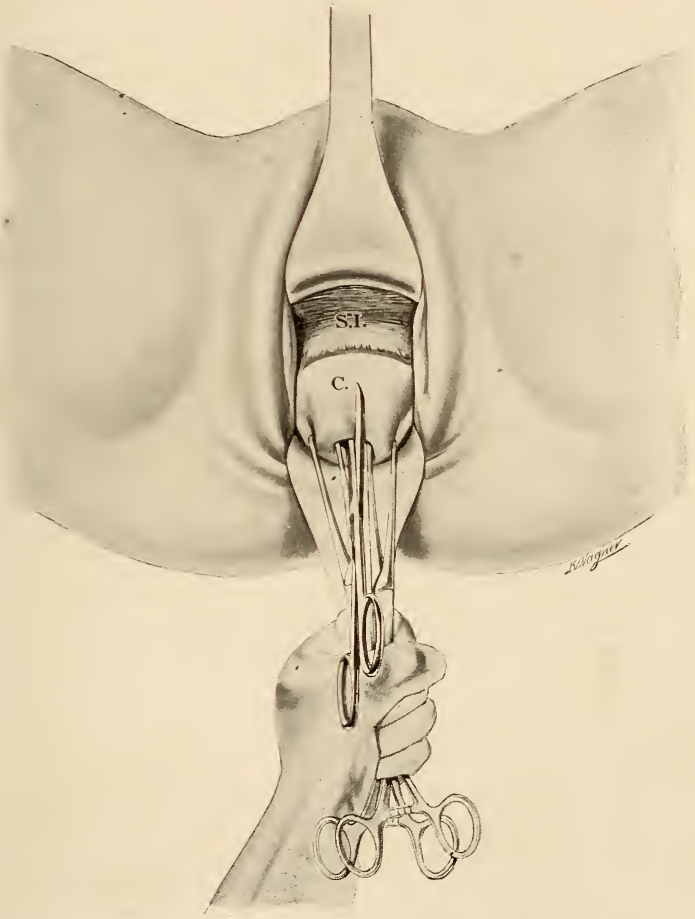


FIG. 335.—Vaginal hysterotomy. Longitudinal, median incision.

lower uterine segment. It should be *exactly in the median line* in order to avoid the lateral branches of the uterine arteries (Figs. 335, 336 and 337). There is usually very little hemorrhage. The incision should not exceed ten or eleven centimetres in length. If it does it is likely to pass the point where the peritoneum is adherent to the uterus. On the other hand, if it

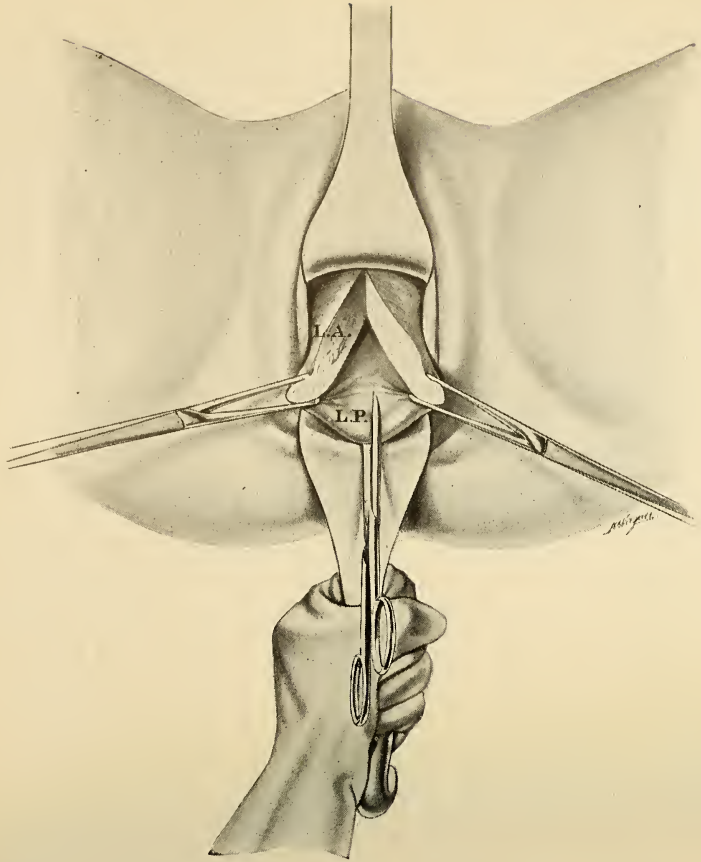


FIG. 336.—Vaginal hysterotomy. Anterior incision having been made, the operator is about to make a posterior one.

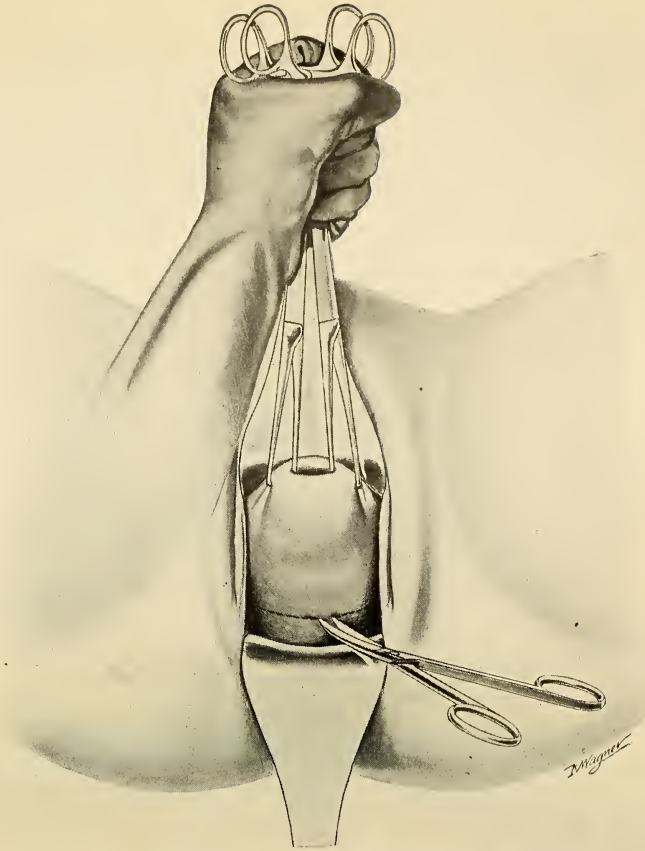


FIG. 337.—Vaginal hysterotomy. Stripping the mucous membrane posteriorly. Preliminary incision.

is too short it may tear and thus open the peritoneal cavity. A very useful suggestion of Jeannin is that the assistant seize the tissues on either side of the incision with the traction forceps and make downward traction, taking a new hold higher up at intervals as the operator prolongs his incision. This facilitates the work remarkably.

Dührssen himself advises that a large de Ribes bag be introduced and used as a guide instead of the finger. This also draws down the cervix, making it more accessible. He also states that there is a tendency to relaxation of the uterus after this operation. This we would naturally expect to follow such a sudden evacuation of the uterine contents, and it is probably wise to follow Dührssen's suggestion and pack the uterus with gauze before suturing the incision.

THIRD STEP: DELIVERY OF THE FŒTUS

The membranes are now ruptured and the fœtus is extracted by forceps or version, according to indications. The man accustomed to obstetrical operating will perhaps succeed better by version, but if the head presents at the opening and the attendant is a skilled obstetrician, the forceps should be applied, being equally safe for the mother and far less dangerous for the child. If the latter is dead, craniotomy should be promptly performed; if it is of unusual size, a posterior incision may be necessary. In making the posterior incision the cervix is seized by a traction forceps and drawn upward toward the symphysis. The incision is made as already described, but the longitudinal incision should not be more than half as long as the anterior one. Bumm, in 52 cases, has not found the posterior incision necessary. My own opinion is that if a posterior incision must be made before the fœtus can be extracted it is evident that the case was one for delivery by abdominal, not vaginal, section.

As a rule it is better to deliver the placenta manually, taking care to remove the membranes at the same time. Anterior hysterotomy is, or, at all events, should be, performed only in critical cases, and in such cases one does not like to prolong the anæsthesia. Moreover, if, as is so often the case, there is a tendency to uterine relaxation, it is not well to delay packing the uterus.

Unless good contraction ensues, and all hemorrhage ceases, the uterus is now packed with sterile gauze. This is done after the posterior incision, if there be one, is closed, and before the sutures are placed in the anterior wall.

FOURTH STEP: CLOSURE OF THE INCISIONS

The incisions are closed by interrupted sutures of medium gut, which should stop just short of the mucous membrane. The vaginal mucosa is closed by a continuous suture of fine gut (Fig. 338). The suturing is much facilitated by placing a traction suture at a convenient height and making traction on this while other sutures are being placed. This not only facili-

tates the process, but aids to check any bleeding which results from the incision. I have often noted the good effect of traction in temporarily arresting hemorrhage from a lacerated cervix. The operator should not forget that pressure upon the fundus makes the cervix much more accessible.

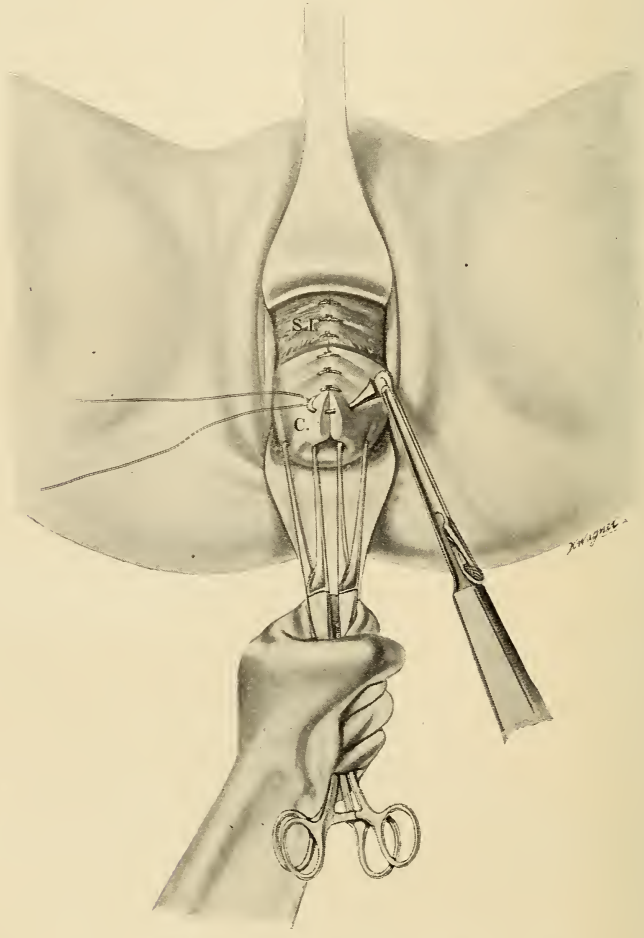


FIG. 338.—Vaginal nysterotomy. Suture of anterior incision.

Advantages.—The undeniable advantages of this operation are its simplicity and rapidity of execution, and the fact that it does not involve the peritoneal cavity. It can be completed in from 20 to 30 minutes by any man of fair surgical training, even if the cervical canal persists, and is far safer than forcible attempts at dilatation by the hand or by steel instruments. It makes a clean cut wound in the least vascular portion

of the uterus, one that can easily be sutured under the guidance of the eye, instead of a ragged and dangerous wound extending perhaps out into one of the broad ligaments, one that cannot be sutured at all. Its very advantages, however, have led to its too frequent employment.

Disadvantages.—Bad after-effects are often observed. As might be expected, union is often imperfect. Vesicovaginal fistula has been observed. The liability to rupture in a subsequent pregnancy should not be forgotten. Voorhees reports that in the examination of a large number of cases in which the operation had been performed by good operators, he has always found some disability, such as deep fissures in the anterior lip, erosions, granular inflammation, pain, leucorrhœa, etc. These consequences must, of course, be disregarded if the condition present involves imminent danger, but they are quite sufficient to condemn its performance in cases in which the tampon or the rubber balloon will serve the same purpose. Another disadvantage is the fact that the safety of the child is not practically guaranteed, as in the abdominal Cæsarean section. If any mistake has been made in the estimation of its size, or if the operator is not a competent obstetrician, extraction may present unexpected difficulties.

Indications.—This operation may be indicated when prompt delivery is necessary and the condition of the cervix or the necessity of great haste forbids manual dilatation. These indications are considered elsewhere in connection with the pathology of labor, and it is unnecessary to repeat them here. One thing, however, should be emphasized. The operation has of late become fashionable, and there is good reason to believe that it has been too readily and too lightly undertaken. For example, it is an absurdity and an injustice to the patient to perform hysterotomy in placenta prævia at five or six months, or for the delivery of a dead or non-viable fœtus. I have known it to be performed when a simple cervicovaginal tamponade would have answered every purpose, and I have no hesitation in saying that the man who finds it necessary to practise this procedure very often, while he may be proficient in surgery or in pure gynæcology, is not a competent obstetrician.

Nevertheless, it must be admitted that it is an ideal method in certain cases, chiefly in those cases which were formerly treated by the so-called *accouchement forcé*. Typical indications are to be found in severe cardiac and pulmonary crises with threatened pulmonary œdema, and in bad cases of accidental hemorrhage. Here the saving of time is of prime importance. Again, cicatricial or carcinomatous hardening of the cervix may prevent dilatation and make necessary the use of the knife.

If the child is alive and viable hysterotomy becomes an alternative to the abdominal Cæsarean section, and if conditions are favorable the latter is always to be preferred.

Contra-indications.—The operation is, of course, contra-indicated in cases of marked pelvic contraction and when the child is dead. If the

patient is a primipara, with small vagina and vulval orifice, extensive laceration is hardly avoidable, and if conditions are favorable abdominal Cæsarean section is again to be preferred. The same statement is true of cases in which the patient is over-time and the child presumably over-large.

In a general way, too, one may say, *and this is very important,* that it is contra-indicated whenever the slower methods will suffice.

Cervical Incisions

Deep incisions of the cervix, otherwise known as Dührssen's incisions, are still practised by some operators. These incisions are only made after the cervical canal has been obliterated. They extend to the cervico-vaginal junction and no further. After delivery the resulting wounds are sutured. These incisions are now superfluous. Moreover, they are not free from serious risk, since during the subsequent delivery the incisions may extend indefinitely by tearing. The condition is much like that which obtains in a hysterotomy in which the incision has been too short.

To Sum Up.—Before the cervix will admit, or can easily be made to admit the finger, or in other words, before the last three or four weeks of pregnancy, the cervicovaginal tampon is by all odds the safest and best method of securing dilatation. The technic is given in connection with the induction of abortion to be presently described.

After this time Voorhees's modification of the de Ribes bag is to be preferred.

Manual dilatation finds its best field in cases that have already been partly dilated, and whenever practicable should be reserved for such cases. It is often necessary preliminary to the forceps operation and to version.

Hysterotomy should be reserved for cases in which a delay of a few hours plainly involves serious danger.

If the use of the steel dilators becomes necessary, the graduated dilators are to be preferred to those of the glove stretcher variety.

CHAPTER XXVI

THE INDUCTION OF ABORTION AND OF PREMATURE LABOR

Induction of Abortion. Indications. Technic of Induction During the First Three Months. Technic of Induction During Second Three Months. The Induction of Premature Labor. Indications. Different Methods, with the Technic of Each. The Method of Krause. The Tampon. The Rubber Bags. Manual Dilatation

By the induction of abortion is meant the artificial interruption of pregnancy during the first twenty-eight weeks; *i.e.,* before the fœtus becomes viable. The artificial interruption of pregnancy at any subsequent period is known as the induction of labor.

Indications for the Induction of Abortion

Most physicians believe that the induction of abortion is indicated if it appears certain that the continuance of pregnancy will destroy, or seriously imperil, the life of the patient. If we could always be sure that the continuance of pregnancy would have this effect, the problem would be easier; but since certainty is not always attainable, difficult questions will continue to arise. The conditions which may bring about such a state of affairs are considered elsewhere, and it is only necessary to summarize them here. Among the most common are pernicious vomiting, incipient tuberculosis in early pregnancy, pernicious anæmia and leucocythæmia, cardiac disease with beginning failure of compensation, and chorea.

Examples of local conditions are placenta prævia, mole pregnancy, and death of the fœtus, with decomposition of the uterine contents. Retroflexion of the gravid uterus with incarceration, formerly considered a positive indication, may, if the circumstances are favorable, be treated by laparotomy.

Eclampsia, or threatened eclampsia, seldom constitutes an indication for the induction of abortion, but it often justifies the induction of labor. On the other hand, true nephritis complicating early pregnancy may well give rise to serious thought.

Indications for the Induction of Labor

These are the same as those for the induction of abortion with some additions. Eclampsia and placenta prævia figure much oftener as indications, after the period of viability has been reached, than before. When there is a history of large children and difficult labors, the induction of labor two or three weeks before term may be not only justified, but im-

peratively indicated, and the same thing is true of cases of habitual death of the fœtus. Many still practise the induction of labor in cases of moderate pelvic contraction, though with the gradual improvement in the results of the Cæsarean section there is less reason for this now than formerly. Acute hydramnion is a rare but unmistakable indication for the induction of labor.

It would carry us far beyond our limits to consider every condition that might possibly justify the induction of labor. In general, however, it may be said that there is at present a tendency to induce labor rather more frequently than occasion demands. Not all the ills that beset a pregnant woman can be cured by the induction of labor. In some cases, *e.g.*, in advanced tuberculosis, and in cardiac cases that are doing well, the results may be immediately disastrous.

Technic of the Induction of Abortion During the First Three Months

Certain operators pride themselves upon being able to complete the induction of abortion at one sitting, by rapidly and forcibly dilating the cervix with branched dilators, breaking up the uterine contents, and emptying the uterus with the curette. All this is done, of course, at the expense of the maternal structures. I have heard this called "the surgical method." Correctly speaking, it is a very *unsurgical* method. Some of the worst tears of the cervix that I have ever seen, tears far worse than those ordinarily produced in labor, and even in forceps operations and versions of average difficulty, have been produced in this way. It is self-evident that an approach to normal conditions, as far as an abortion can be said to present normal conditions, should be sought. In other words, that cervical dilatation should be gradual, and should be preceded and accompanied by softening and obliteration of the canal. This is best accomplished by certain preliminary measures which I shall now describe.

The operation should always be performed in a hospital if possible. This tends to avoid any impression of secrecy and conduces to careful, deliberate and aseptic work.

Asepsis should be rigorous and the rules already given in the chapter on obstetric operations carried out to the letter. In addition to this, the vagina should be thoroughly scrubbed out with sponges of sterilized cotton soaked in a 2 per cent. lysol solution. Rubber gloves should be worn. When a physician takes upon himself the serious responsibility of inducing abortion, he also becomes responsible for the aseptic conduct of the case. Moreover, it has always seemed to me that in this unphysiological process, nature is not able to surround our patients with the natural safeguards that are part of the physiological process of labor. With scrupulous care, however, there is little or no danger.

Ether or ether-oxygen should be the anæsthetic. There are no factors in these cases making for increased safety in chloroform anæsthesia. A

lingering idea that such factors exist in the induction of abortion, as they undoubtedly do in purely obstetrical operations, has been responsible for an occasional death that might have been prevented.

With the patient upon the table and in the lithotomy position a careful bimanual examination is made in order to exclude extra-uterine pregnancy, or an acute inflammatory process in the parametrium, and to determine accurately the position of the uterus. This precaution, too often neglected, is nevertheless highly important. To overlook an extra-uterine pregnancy or a tubal abscess might prove a fatal mistake, and if the operator does not know the position of the uterus, he will not know how his instruments should be curved, or in what direction they should be passed. A careless operator who overlooks a retroversion may easily perforate the uterine wall.

The cervix is now seized and fixed with a tenaculum. A weighted

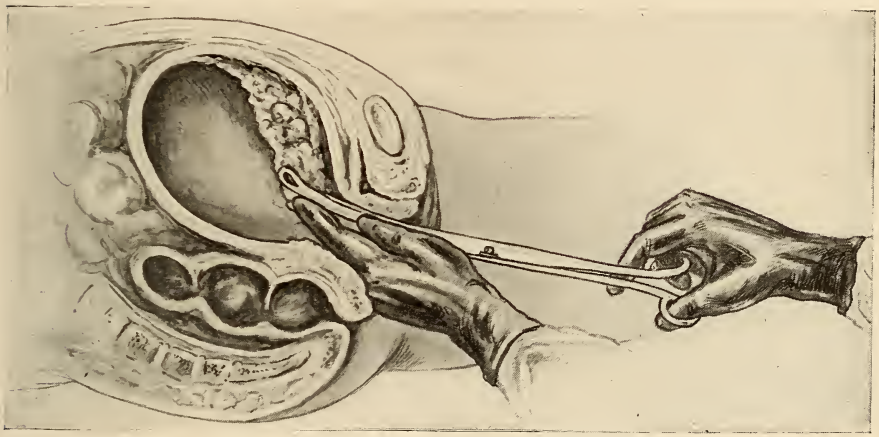


Fig. 339.—Method of using the placental forceps.

speculum is a convenience, but not a necessity. Strong traction is not necessary and may do harm. If the cervix is closed it should be dilated by the insertion of two or three of the smaller sizes of the graduated dilators of Hanks or Hegar. Just enough dilatation for the insertion of a few strands of gauze is the object sought. The branched dilators so commonly used are not suited to this work, and in careless or inexperienced hands are highly dangerous. Dilatation should be slow, gradual, and uniform, and time should be allowed for cervical relaxation. It is not necessary to puncture or break up the ovum, but if this should happen no great harm is done. Cervix and vagina are now tightly packed with gauze and a T-bandage applied. The tampon is allowed to remain from twelve to eighteen hours. At the end of this time the cervix will usually have become softened and dilated to the extent of admitting the finger, by means of which the operator removes the bulk of the uterine contents, and determines that the uterus is empty.

The subsequent treatment of the case is that of incomplete abortion and has already been given. The bulk of the ovum should always be removed with the finger if possible. If pregnancy is of less than three months' duration, curettage should be performed. A single douche of hot salt solution helps contraction, limits hemorrhage, and washes out fragments that may have been left. It is not absolutely necessary, however.

Now and then one meets a case in which the cervix admits the finger, but the canal is still preserved, and the finger can reach, but not grasp, the uterine contents. Here the experienced operator can usually succeed with the placental forceps and blunt curette (Fig. 339). The beginner, however, will do well to repeat the tampon, this time tightly packing the cavity of the uterus and thus insuring the easy removal of its contents twelve hours later.

It is well to use mildly iodized gauze for the second tampon.

Technic During the Second Three Months

During the fourth, fifth and sixth months the tampon is still the best agent for provoking uterine contractions and bringing about dilatation of the cervix. The rubber bags, so useful in the latter weeks of pregnancy, do not work well here. Considerable dilatation with steel instruments may be necessary to permit the introduction of even the smallest size. The long and hard cervix dilates slowly, the process may last for days, and the successive introduction of larger sizes, with the attendant manipulations, discourages the patient and predisposes to infection.

There is little likelihood of the delivery of an intact ovum at this time, and it is well before introducing the tampon to rupture the membranes with a sound and allow the amniotic fluid to drain away. This, in itself, ushers in uterine contractions and markedly assists the action of the tampon. Indeed, if there is no special reason for haste the rupture of the membrane is usually all that is necessary.

The subsequent progress of the case closely resembles premature labor and calls for no special comment.

Induction of Premature Labor

After the child becomes viable, *i.e.,* after the beginning of the seventh month, two lives are to be considered. As a general rule, rupture of the membranes is to be carefully avoided, since it distinctly increases the risk to the child. This is especially true in the case of a primipara with long and hard cervix. There is also a slightly increased risk to the mother, owing to the fact that the first stage is usually prolonged, and decomposition of the uterine contents more probable. The artificial rupture of the membranes is, however, the ideal method in certain cases, *e.g.,* in hydramnion, and twin-pregnancy, *q.v.* It is also of great value as an auxiliary to other methods, or as a substitute for them in case of their failure.

THE METHOD OF KRAUSE

A time-honored and still popular method is that of Krause, which consists of the introduction of a No. 17 Fr. bougie, or of a rubber catheter of similar size, between the ovum and the uterine wall. The presence of the foreign body excites uterine contractions. If a catheter is used it is introduced by means of the contained stylet, which is withdrawn later.

Technic.—With the patient in the lithotomy position the cervix is exposed by broad specula and the anterior lip fixed by two volsella, which are entrusted to an assistant. The operator now passes his finger between the cervix and the anterior uterine wall and separates the membranes as high as he can conveniently reach. This facilitates the entrance of the bougie, and lessens the danger of rupture of the membranes (Fig. 340).

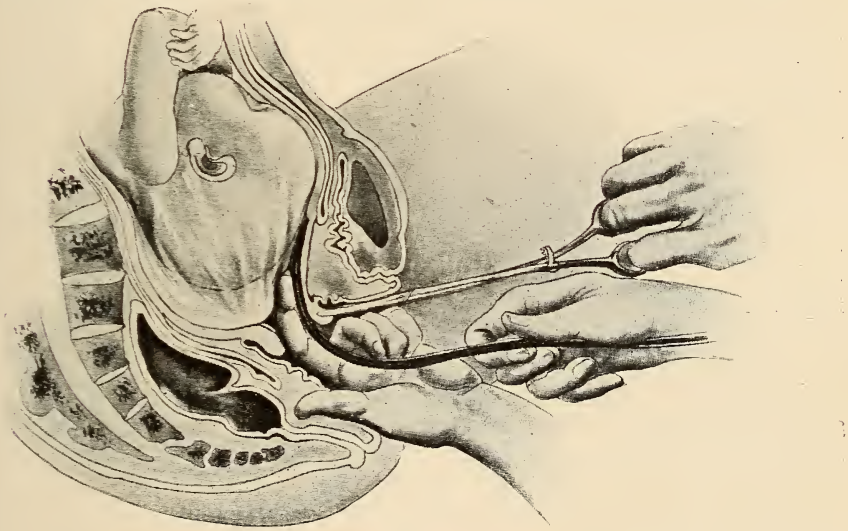


Fig. 340.—Introduction of the bougie.

Two fingers of the left hand are now passed up into the area of separation, and between the two fingers as a guide the bougie is passed cautiously upward until but a few inches are left, protruding from the cervix. It is better to pass it anteriorly, since otherwise it may be arrested by the promontory of the sacrum. This is especially true when labor is induced on account of pelvic contraction. Then, too, the placenta is usually located upon the posterior wall. Should resistance be encountered, it is likely that the point of the bougie is impinging upon the placenta, and in this case it should be withdrawn and reëntered at another point. When the bougie is in place the vagina is lightly packed with gauze. If the membranes are ruptured the bougie is no longer necessary and should be removed. If hemorrhage occurs, the cervix and vagina should be packed with gauze.

If there are no contractions in from 12 to 24 hours another bougie may be inserted alongside the first.

This method is perhaps the easiest, and in many cases gives good results, but it has certain disadvantages.

In the first place, it is very uncertain in its action. Hours, and even days, may elapse before uterine contractions are excited, and in some cases they are not evoked at all.

In the second place, there is considerable danger of rupture of the membranes; this accident has happened many times to men of experience.

The third and most serious objection is the danger of infection, which in my opinion is greater in this than in other methods of inducing labor. This has also been the experience of many others, including the authorities of the great Rotunda Hospital in Dublin. It is quite true that this danger may be much diminished by careful technic, but there are certain dangers that are inherent in the operation itself. It is difficult or impossible to sterilize the bougie, and there is the additional danger involved in passing it through the vulva and vagina, which are not sterile, up to the placental site, the most vulnerable point in the birth canal.

THE TAMPON IN THE INDUCTION OF LABOR

Even after the period of viability has been reached, the tampon remains the safest and best agent for bringing about dilatation of the cervix up to the time when the latter will admit, or can easily be made to admit, the finger. After one or two fingers are admitted, a Voorhees bag is inserted.

THE RUBBER BAG IN THE INDUCTION OF LABOR

When, however, the finger can be passed through the cervix with no great difficulty, *i.e.,* approximately four to six weeks before term, the bags are safe, convenient, and effectual, and the tampon quite unnecessary. The technic of their use has already been given.

Some writers advocate the use of the bags in the sixth, seventh and eighth months, while the canal of the cervix is still preserved and undilated. This involves a preliminary dilatation by steel dilators and the risk of a bad tear, especially if the branched dilators are used. In my opinion it is seldom necessary.

The inexperienced obstetrician, and the man whose training has been chiefly surgical, is prone to find occasion for grave operations in conditions which the practised accoucheur successfully combats by milder methods. There are few cases in which the delay required for conservative measures involves as much risk as does the additional burden of a rapid operative delivery.

No matter what method of inducing labor is chosen, it is well, whenever time permits, to give an ounce of castor oil the night before beginning the operation. In many cases this will prove to be all that is necessary. There is something almost specific in the effect of castor oil in these cases.

This fact, well known to the monthly nurse, has apparently been overlooked by many teachers and writers upon obstetrics. Its effect is most marked in the latter weeks, and becomes greater as the period of labor approaches. In many cases, if a patient receives an ounce of castor oil at night, labor pains begin the next morning. It is therefore wise to precede the induction of labor by the administration of castor oil. Of course the converse of this is also true. Castor oil should never be given to a pregnant woman unless it is intended for some legitimate reason to induce labor.

Another drug which aids very materially in the induction of labor is pituitrin. There are many cases in which, after preliminary dilatation of the cervix by the bag or tampon, and after some progress has been made, the contractions are slow and inefficient and the labor bids fair to be long delayed. In these cases pituitrin is often of great value in hastening the process. The contra-indications to its use are given elsewhere.

Manual dilatation is not in itself a method of inducing labor, but it is sometimes most valuable in accelerating the progress of labor. For example, when by the use of the rubber bags or by some other method the canal of the cervix has been made to disappear, and the external os has become dilated to the extent of admitting three fingers, the process may be hastened, or indeed rapidly completed, by simply stretching the cervix with the fingers of one hand and then rupturing the membranes.

The operator should not think that his task is over when once he has succeeded in starting the "machinery" of labor. He who induces labor before term is under a peculiar obligation to look carefully after the welfare of the fœtus. He should on no account neglect the careful auscultation of the fetal heart. He should not allow himself to forget that the power of resistance of these premature children is less than normal, and that it is not well in these cases to permit the second stage of labor to continue too long. If operative delivery becomes necessary he should remember that, as we shall see in the next chapter, the forceps are usually safer in these cases than version, and that by the use of Kristeller's method we may even be enabled to dispense with operative delivery altogether.

CHAPTER XXVII

THE FORCEPS

Definition.—The obstetrical forceps is an instrument by means of which traction is made upon the fetal head for the purpose of effecting or hastening delivery.

Historical.—The story of the Chamberlen family, Englishmen of French descent, of how they invented a crude, but fairly effective, short, straight forceps, how they kept their secret for a hundred years, and how their invention finally became public, is familiar to every student of obstetrics. It is an unsavory history, dealing as it does with those who, like the quacks of to-day, would capitalize the sufferings of their fellowmen; relieved by the story of the philanthropic Hollanders, Vischer and Van der Poll, who gave away what information they had been able to purchase about the new instrument, and of the eloquent Frenchman, De La Motte, who denounced with biting words those who would keep such a secret for money.

The original forceps of the Chamberlens was a simple straight forceps, crude in construction but, nevertheless, embodying the mechanical principles of the forceps of to-day. It had but one curve, the cephalic, and hence was adapted only to cases in which the head is low in the pelvis. With the passing of the years the instrument of Chamberlen became modified. Smellie, in England, and Levret, in France, made it longer and added a second curve, designed to correspond with the axis of the pelvic canal. In France, owing to the teaching of the Church, which emphasized the value of fetal life, the forceps were devised for use at or above the pelvic brim, and were, therefore, longer and stronger and had a more pronounced pelvic curve than those used in England and Germany, where version was usually preferred. To some extent this difference continues until the present day. Both forms have survived as they deserved. One for the high, and the other for the low, operation.

In 1877 the master mind of Tarnier perfected the axis-traction forceps, and in his latest model we have, I believe, the perfection of forceps construction.

Construction.—Handles are of various patterns, the essential features, common to all, being the lateral projections at their junction with the lock. These projections are indispensable for traction. The three varieties of lock are the English, French and German. The English lock is easy of adjustment, simple in construction, and is to be preferred in easy operations with the ordinary forceps. The French lock, which requires a separate screw, is somewhat more complicated, but is indispensable in difficult cases when the Tarnier forceps are used, since it holds blades and head solidly

together, making them, as it were, of one piece. The German lock is an attempt to combine the advantages of both.

The shanks may be separated, the separation beginning at the handles, as in the Simpson and Tarnier forceps, or they may be superimposed, as in most other models. In the latter case the instrument has more compressive power and is, at least in careless or unskilled hands, more dangerous to the fœtus. The shanks may be long or short. In the short forceps

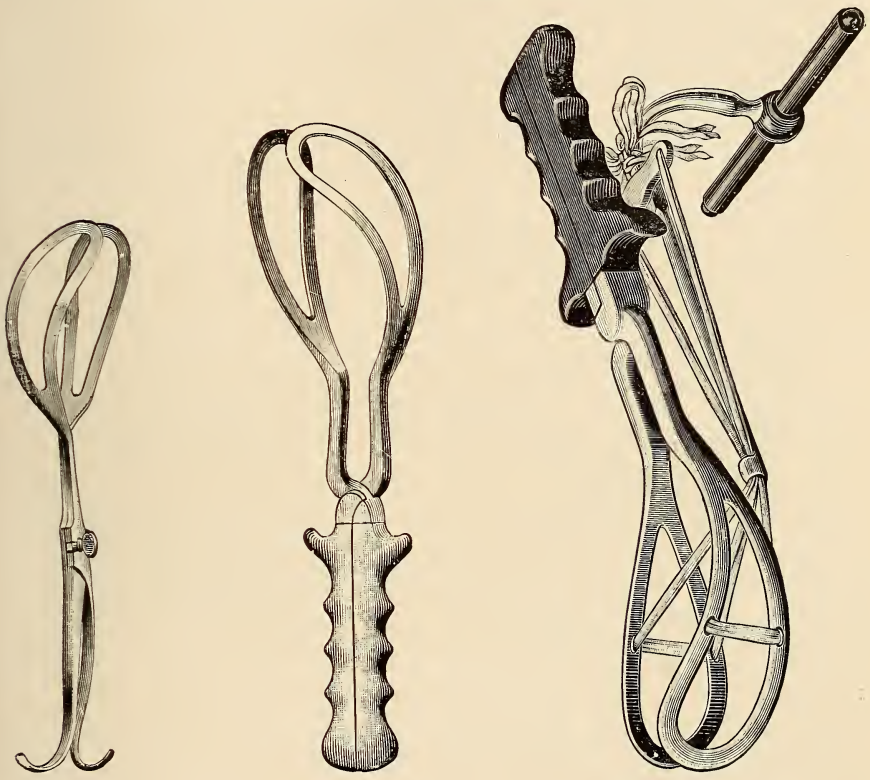


FIG. 341.—Hodge, Simpson, and Davis forceps.

there may be hardly any shanks at all, the pelvic curve beginning almost at the lock. In other cases the shanks are long, the pelvic curve beginning at some distance from the handles. The latter plan is preferable, since the longer instrument has more power and leverage, and can be used with much more delicacy of manipulation. It is a gross error to suppose that an instrument is less likely to do harm because it is short and weak. The blades may be wide, as in the Hodge or Davis forceps (Fig. 341), or narrow, as in most other models. The latter plan is preferable. The wide blades were intended to embrace the parietal eminences. The increased

width is unnecessary and makes the introduction of the blades more difficult. This is especially true of the introduction of the second blade.

The blades may be fenestrated, as in most models, or solid, as in those of Ohlshausen and McLane. Solid blades are easy of introduction, rotation, and withdrawal, but so much compression is required to prevent them from slipping that the danger to the child is much increased (Fig. 342).

The forceps blade has two curves: the curve "on the flat," or cephalic curve, and the curve "on the side," or pelvic curve. In my opinion, there is never any necessity for a marked cephalic curve, and such a curve is always a bad feature. No blade can have a pelvic curve which is adapted to both the high and the low operation. For the low operation a very moderate pelvic curve is best. Indeed, the straight forceps formerly used is much better suited to this operation than an instrument with a marked pelvic curve.

The "Properties" of the Forceps.—The older writers were accustomed to speak in quaint fashion of certain "properties," or "functions," of the forceps. These "properties" are traction, compression, leverage,

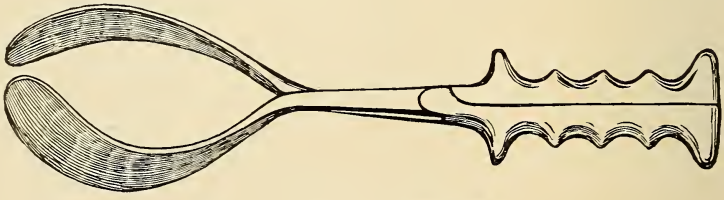


Fig. 342.—Tucker–McLane forceps.

and dynamic action; to which we have recently added rotation. Traction, of course, is the chief function of the forceps. In the light of modern teaching compression is to be considered as incidental and unavoidable. The forceps is not to be used as a cephalotribe. The forceps is seldom used as a lever. One of the very rare instances of such use is in the so-called pendulum tractions to be described later. In some cases the mere presence of the forceps blades in the uterus excites contraction. This is known as the dynamic property of the forceps. Contractions occur with some evidence of progress before the first traction is made. The assistance thus afforded by nature is welcome when it comes, but unfortunately it cannot be relied upon. Rotation is best illustrated in the treatment of occiput-posterior cases, which will be presently discussed.

Varieties.—There have been many modifications of the forceps. To describe and reproduce them all would be a profitless task. Most of them are of interest from an historical standpoint only. The description of a few typical forms will suffice.

Let us begin with the ordinary instrument; the instrument suited to the low operation. The accompanying illustrations show some types in common use. Most generally employed, perhaps, is the Simpson forceps, born

in Scotland, but very generally used throughout Great Britain and the British colonies, as well as in the United States and in Vienna. It is an excellent instrument for easy cases. The pelvic curve is very moderate, as it should be in an instrument designed for the low operation. The shanks are not superimposed but separated, the separation beginning at the lock. This is an important feature of the Simpson forceps, diminishing as it does the danger of compression and thus greatly lessening the risk to

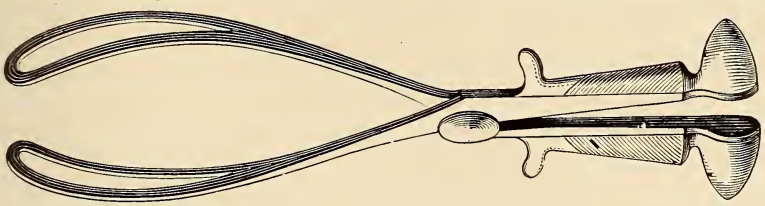


FIG. 343.—The Nægele forceps.

the fœtus, especially in the hands of the careless or inexperienced operator.

The Nægele forceps, much used in Germany, has the German lock already described. Its pelvic curve is too great for the low operation and its length insufficient for cases in which the head is at the brim of the pelvis (Fig. 343).

The Elliott forceps (Fig. 344), a favorite in New York and vicinity, a rather light instrument with superimposed shanks and moderate pelvic

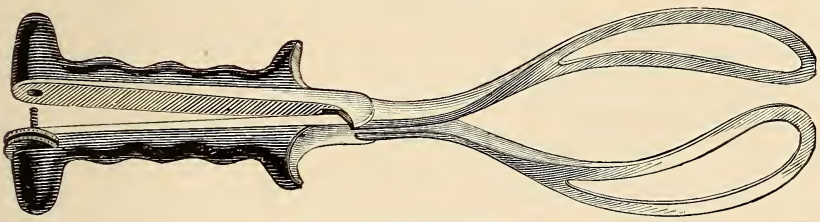


FIG. 344.—The Elliott forceps.

curve, is convenient and efficient in easy cases, but should be used with some care, as it compresses the head more than the Simpson model. The same caution applies with even greater force to the solid blade forceps already mentioned. The earlier models of the Elliott forceps had a very moderate pelvic curve and are much preferable to those now in use. The latter represent an attempt to construct an instrument suitable for both the high and low operations. Such attempts are always unsuccessful.

CHOICE OF INSTRUMENT

It is an absurdity to ask which is the best forceps. There is no forceps which is "best" for all purposes. In the high forceps operation, for example, a somewhat marked pelvic curve is a necessity. This curve becomes less necessary as the head descends in the pelvic canal. At the

outlet it is a positive disadvantage, the handles often touching the mother's abdomen and the shanks coming into contact with the tissues in the neighborhood of the anterior commissure, during the raising of the handles which accompanies the final extension of the head. On the contrary, the ordinary forceps with a slight pelvic curve are entirely inefficient in the high operation, and many such operations have failed because of an inadequate instrument. Then, too, in the case of a primipara with a very small outlet and the head resting on the perineum, it is hardly fair to the patient to use the somewhat heavier blades of the Tarnier instrument (Fig. 345).

Finally, it is sometimes an advantage to substitute one instrument for another in the course of an operation. For it is an undoubted fact, as I have repeatedly demonstrated, that in some cases after the head has been brought well down to the floor of the pelvis by the Tarnier instrument, extraction can be much more easily performed by exchanging the latter instrument for one with a slight pelvic curve.

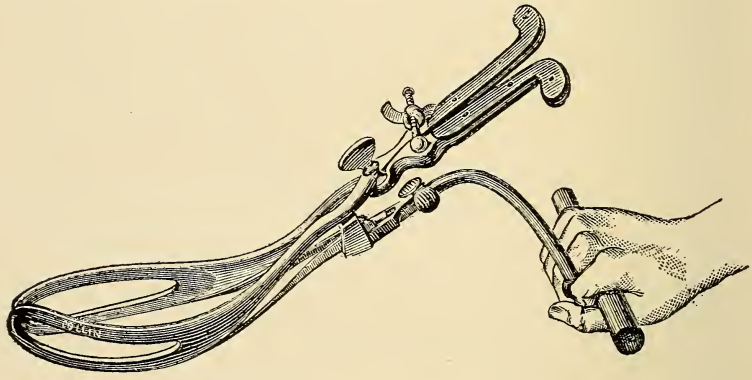


Fig. 345.—Tarnier axis-traction forceps.

I am accustomed to say to my students that every man who intends to do much obstetric work should have two pairs of forceps, an axis-traction model for use in high and median operations, and a Simpson or Elliott forceps for use in those cases in which the head has reached the pelvic floor.

Indications.—It would be a useless task to try to enumerate every possible condition or circumstance that might call for the use of the forceps. In a general way they may be grouped under two heads. Those which relate to the mother, and those which relate to the child. Now and then we have urgent indication in the general condition of the mother, *e.g.*, pulmonary œdema, eclampsia, marked exhaustion, antepartum infection, cardiac and pulmonary diseases, in a word, cases in which the continuance of labor directly threatens the life of the mother. In these the indication is clear. The majority of forceps operations, however, are not of this character. They are designed to prevent exhaustion, and to cut short the sufferings of the patient.

Here the problem is more difficult. One does not wish to interfere too soon, but to wait until signs of exhaustion are well marked is to wait too long. The causes of delayed labor are considered elsewhere. Among those that most often make necessary the use of the forceps are posterior positions of the occiput and rigidity of the perineum in elderly primiparæ. *I have frequently found the cause in unusual size of the fetal head. Stout women seem to require operative assistance oftener than others.* Moderate contraction of the pelvis may have passed unrecognized.

The obstetric teacher is often asked "How long should one wait before applying the forceps?" As a matter of fact, no exact time limit can be given. It is not so much a matter of time, as of the condition of mother or child. Perhaps we might say, in a general way, that after two hours of good labor pains in the second stage, or from two and one-half to three hours in the first stage without progress, interference is indicated, but the experienced accoucheur is bound by no such rules. If progress is present, suffering not too severe, and child in good condition, he might wait longer.

On the other hand, if suffering is excessive he might interfere sooner. Of course, if the head is low in the pelvis one is justified in interfering somewhat earlier than one would if the head were higher, since interference is attended with less danger to the mother. This is especially true of the inexperienced operator. Likewise the child is more endangered by waiting after rupture of the membrane.

The caput succedaneum affords a fairly reliable index of the pressure to which the head is being subjected. When a complete arrest of progress is accompanied by a large and increasing caput succedaneum there is little chance that nature will prove equal to the task.

In my experience considerable importance is to be attached to the statements of the patient if she be a woman of intelligence and fortitude, and especially if her physician has attended her in previous labors. When such a patient complains that she "can bear it no longer," that the pains are not helping her, etc., her statements should receive serious consideration. Such cases must, of course, be distinguished from those of neurotic and hysterical patients, who can usually be quieted by chloral.

The older writers taught, and one sometimes hears even now, that one should wait until there is a steady rise in the maternal pulse, but to wait for this is obviously to wait too long. It should be the aim of the obstetrician to learn to recognize the necessity for interference before the signs of exhaustion are present and unmistakable.

Indications from the Side of the Fœtus.—In considering the indications for the use of the forceps, far too little attention is usually paid to the fœtus. It is not too much to say that the most important part of a low forceps operation is the auscultation of the fetal heart. The first symptom of impending asphyxia of the fœtus is a diminution in the fetal heart-rate. As we have already seen, the fetal heart beats more slowly during a con-

traction, but normally resumes its usual rate when the contraction is over. If a heart which has been beating at the rate of from 130 to 160 beats loses 20 or 30 beats, and if this decreased rate is maintained between the contractions, a most careful watch should be maintained. A fetal heart-rate in the neighborhood of 100 is an indication for delivery, if this can be accomplished with no great risk to the mother.

The passage of meconium is often, but not always, an indication of asphyxia and should always lead, if not to the application of the forceps, at least to a most careful auscultation of the fetal heart.

From this it follows that during the second stage of labor the forceps should be at hand, sterilized and ready for use. It is not necessary to employ the instrument because it is ready, but it is a great misfortune not to have it at hand when it is imperatively needed.

Choice Between Forceps and Version

In most cases of delayed labor the choice lies between forceps and version. A study of the indications for the forceps operation then is necessarily incomplete, unless it includes something about the choice between these two procedures.

In the first place, it is to be remembered that failure with the forceps does not preclude the subsequent performance of version, while a version half completed must be finished at any cost. When the head is above the brim and cannot be made to engage, version is undoubtedly safer than a persistent attempt with the forceps.

In cases of malpresentation at the pelvic brim, *e.g.,* face, brow, or posterior occiput, version is preferable.

In the case of a premature child the forceps are usually to be preferred, since owing to the small size of the head delivery is easy, whereas these feeble infants are easily affected by the necessarily rough manipulations of version.

In the case of a primipara, forceps delivery, other things being equal, is preferable as being less likely to result in severe laceration of the soft parts. With the forceps the advance may be intermittent and gradual, but in version the after-coming head must be delivered rapidly if we are to save the life of the child.

In a general way the forceps operation is safer for the child than version. Even in easy versions the unavoidable handling of the cord, and the admission of air into the uterus may result in premature fetal inspirations with resulting asphyxia.

Version should not be undertaken when there is any considerable narrowing of the transverse diameter of the pelvic brim, since the long axis of the head is thus brought into coincidence with the shortened transverse diameter of the pelvis.

Finally, when to interfere cannot be learned altogether from text-books. The observant physician can tell much from the demeanor and

attitude of the patient, and the character of the pains. He must accustom himself to long hours of watching at the bedside. He cannot begin this too early. It is the *only* way in which he can become possessed of that unwritten and unconscious knowledge that is born only of experience and that seldom fails to recognize efforts that are fruitless, and suffering that should no longer be borne. If not willing to make this sacrifice for the good of his patients, he had better choose a less trying calling.

Prognosis.—There should be no direct mortality in the forceps operation, when performed upon a patient in good condition, by an operator of experience and judgment who knows how to recognize conditions that contra-indicate the operation, or forbid its continuance.

On the other hand, when the operation is unskilfully conducted, *e.g.,* when the instrument is applied without an accurate diagnosis of position and presentation, when persistent efforts are made to overcome obstacles by brute force, when the forceps are applied through a half-dilated cervix, or when the narcosis is unduly profound and prolonged, the danger to life is considerable, and more or less subsequent disability very probable. The particular dangers incident to these and other blunders are considered elsewhere. Severe laceration of the cervix, attended by hemorrhage and shock, is the complication that it has most often been my lot to witness.

The danger of infection is, of course, somewhat greater than in normal delivery, but with proper precautions this danger becomes almost negligible.

It is usually stated that the low operation is practically without danger, that the median operation is a little greater risk, and that the high operation is the most dangerous of all. In a general way this is true, but in practice one meets with many exceptions, *e.g.,* if the head is not large, and other circumstances are favorable, the high operation may be surprisingly easy, while if the head is very large the median operation may tax the resources of the elect.

There is not the slightest doubt that the fetal mortality is somewhat higher when the forceps are used than in labor strictly normal. Exact statistics are not available. Much of the mortality is due to improper technic. On the other hand, however, the timely and skilful use of the forceps often results in the saving of fetal life. Experience long ago convinced me that better results are obtained when the axis-traction instrument is employed.

Conditions Which Justify the Application of the Forceps

A presentation of the head, or, rarely, of the breech. A living child. A pelvis without marked contraction. The head should not be hydrocephalic or too large for the pelvis. The latter point is difficult to determine. It is hardly necessary to tell any sane man that the membranes should have ruptured, but many very intelligent practitioners do not seem to know that the cervix should be fully dilated. This leads to the consideration of an important subject which requires separate consideration, viz.:

PRELIMINARY DILATATION OF THE CERVIX

The forceps are not to be applied until the cervix is completely dilated. The custom formerly taught and unfortunately still practised by many, of applying the forceps through a half-dilated cervix and using the head as a dilator, should be unreservedly condemned. It has often resulted in bad tears of the cervix, with severe hemorrhage and subsequent invalidism. In other cases the operator has not been able to complete the operation at all.

When the application of the forceps is indicated, and the cervix is but partially dilated, dilatation should be completed manually by the method already described. It is then usually easy to push the head well down into the cavity of the pelvis by external pressure, and the operation is thus made much easier than would otherwise have been the case.

To tell the student that cervical dilatation is a necessary condition of the forceps operation, and not to tell him at the same time that if the cervix is not dilated he himself must accomplish the dilatation, is to leave him utterly in the dark. In many of the cases in which dilatation is most urgently indicated it will never be accomplished by the unaided efforts of nature.

Classification.—Broadly speaking, forceps operations are of three kinds, high, low and median.

When the greatest diameter of the head is still above the brim, the operation is known as the high operation.

When the above diameter has passed the brim, but rotation has not occurred, the head remaining transverse or oblique in the pelvic cavity, the operation is known as median.

When the head is well down upon the pelvic floor and the occiput has rotated or almost rotated under the pubic arch, the operation is called low. We must remember, however, that in some cases the occiput does not rotate until the very moment of emergence.

In cases in which the head is floating above the brim and cannot be made to engage after the membranes have been ruptured and the cervix dilated, the forceps are usually contra-indicated.

General Considerations.—The mechanics of the forceps operation are somewhat confusing at first, and it is well for the beginner to fix firmly in his mind a few general rules *which are absolutely indispensable*. It is my obervation that those who do not learn these rules at the beginning do not learn them at all, and never become proficient operators. *Let the beginner learn them here and now.*

In all cases in which the head occupies the right oblique diameter or when it is transverse with the occiput pointing toward the left, the left or lower blade is applied first. These cases, since they include the more common L. O. A. and R. O. P. positions, as well as all low cases, constitute the great majority (Figs. 346 and 347).

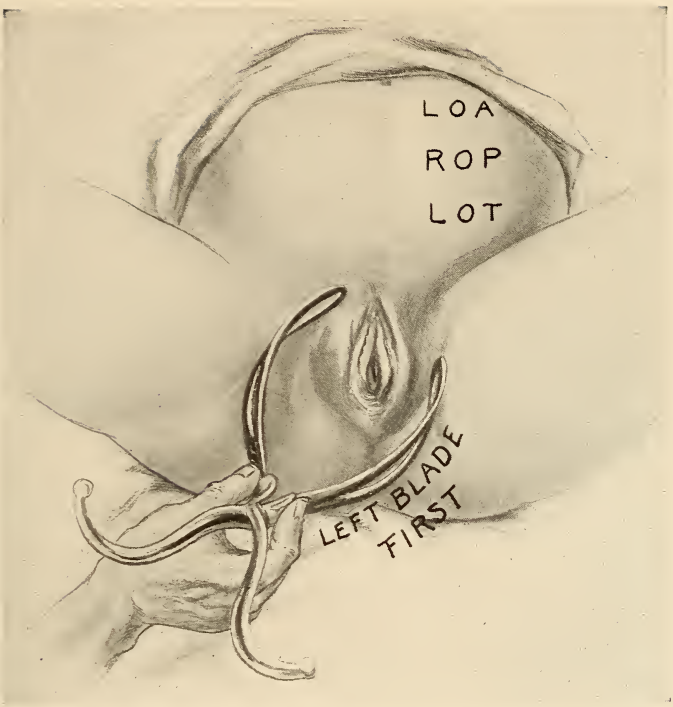


FIG. 346.—Forceps held as they would be applied in the above positions.

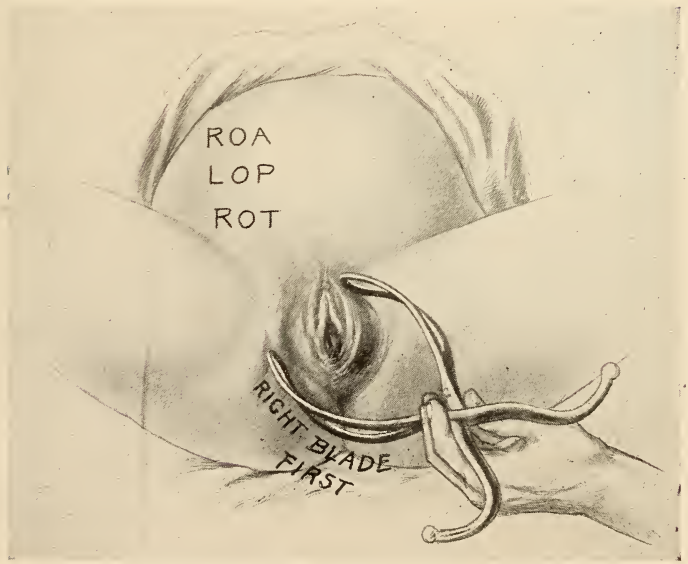


FIG. 347.—Forceps held as they would be applied in the above positions.

When, however, the head occupies the left oblique diameter, *i.e.*, when it is in the less common R. O. A. or L. O. P. positions, the right or lower blade, which is held in the right hand and which is passed into the right side of the pelvis, is introduced first. The latter fact, which will presently be illustrated and explained, should constantly be kept in mind.

Except in high cases and when the head occupies the transverse diameter of the pelvis, the forceps are to be applied, if possible, to the sides of the head and not with reference to the sides of the pelvis.

Technic.—I am accustomed to teach that all forceps operations should be performed upon a table. A low table is preferable, because of the upward traction that must be made during the stage of expulsion. It is true that the cross-bed position suffices for easy operations, but one cannot always be sure that a given operation will be easy. Even the experienced accoucheur is occasionally deceived. There are many sources of error. It is often difficult or impossible to recognize unusual size of the head. A large head with a pronounced caput may be found to be considerably higher than was supposed, a posterior position of the occiput may have been overlooked, a slight pelvic deformity may have passed unnoticed, and so on. Even if the operation is not difficult it may be necessary later to pack the uterus for hemorrhage, or to repair cervix or perineum. These operations as well as the forceps operation cannot be properly done with the patient in bed.

This operation, in view of the frequency with which it is performed and the fact that two lives are at stake, is perhaps the most important operation in all surgery. It is the height of folly to undertake such an operation, except under favorable circumstances, or at least under circumstances that are as favorable as they can be made. The general technic has already been considered. Two features are well worth repetition. The importance of strictly limiting the amount of the anæsthetic, and of emptying the bladder as a final preliminary measure. A rupture of the bladder is an unpleasant complication of the lying-in period. Now and then the obstetric consultant is called to a case in which the sole cause of delay is a distended bladder, the use of the catheter making the forceps operation unnecessary.

Posture of the Patient.—Some operators, especially in Great Britain, prefer to apply forceps with the patient in the lateral position. In my opinion the dorsal position is preferable, since asepsis is more easily maintained. The patient, however, may, if desirable, be placed in this position during the operation. In some cases of high arrest, in which the Tarnier instrument is used, traction in the axis of the brim may be more conveniently and efficaciously made with the patient in the Sims position.

Anæsthesia.—The administration of anæsthetics in forceps cases is an art to be acquired and is quite different from anæsthesia in general surgery. It deserves and will repay much study. As we have already seen,

too much of the anæsthetic is usually given in obstetric operations and this is especially true of the forceps operation. Here there is no necessity, as, for instance, in version, for profound narcosis and complete relaxation. Indeed, the reflex response of the uterine muscle and the help of half voluntary efforts of the patient are often of great assistance. It is, therefore, in most cases, an advantage to withhold the anæsthetic for a time in order to see what the uterus can accomplish, unaided or assisted by pressure upon the fundus, without, as a rule, removing the forceps.

In easy cases, the most important part of the operation is the securing of a correct application, and for this complete anæsthesia is usually necessary, but not necessary or even desirable to keep the patient profoundly narcotized during the subsequent course of the operation. The danger of hemorrhage and of fetal narcosis are minimized by strictly limiting the amount given. Between tractions primary anæsthesia is all that is necessary. As soon as the head is delivered the anæsthetic should be discontinued.

What anæsthetic shall be used? In making a selection the physician will do well not to disregard the question of the comparative safety, both to mother and fœtus, of the anæsthetics in general use, especially in prolonged operations and in cases of threatened or actual hemorrhage, not forgetting that for primary anæsthesia ether is the much safer agent in the hands of a nurse or bystander.

Personally I prefer ether, given by the drop method, in practically all cases. The danger of postpartum hemorrhage after chloroform anæsthesia is a very real one, even in short operations, and should always be borne in mind. In such cases ergot should be given as a routine practice and the patient should be carefully watched for not less than two hours.

If it becomes necessary to give an anæsthetic after delivery, for instance in the case of perineorrhaphy or manual removal of the placenta, ether or nitrous oxide-oxygen should always be preferred to chloroform.

Final Examination.—A final examination for purposes of diagnosis should precede the application of the forceps. It is absolutely essential that all doubt as to the position and presentation should be removed. Previous examinations may have been unsatisfactory, but now, with our patient unconscious and relaxed, previous difficulties disappear and doubtful conditions become plain. It is only by this final examination that we can be assured of the exact position of the head and of the diameter in which the forceps should be applied. In many cases it is only in this way that we can be sure that the forceps operation is really indicated at all. Much harm is constantly resulting from neglect of this final examination. Now and then the obstetrical consultant is called to see a patient who has been subjected to prolonged efforts with the forceps which might and should have been avoided had this precaution been taken.

If the head is well down in the pelvic cavity the diagnosis can usually be made by means of the sutures and fontanelles, but if the head is high or the scalp so much swollen that the sutures cannot be plainly made out, it is well to introduce the half-hand and locate the posterior ear, thus removing all doubt.

The Low Operation

Everything being in readiness, the operator proceeds to introduce the first blade, which is usually the left. The blade is first held perpendicularly with the concavity of the blade toward the vulva, as shown in Fig. 348. The handle should be held with the tips of the thumb and fingers, somewhat as one would hold a pen. A clumsy or inexperienced operator

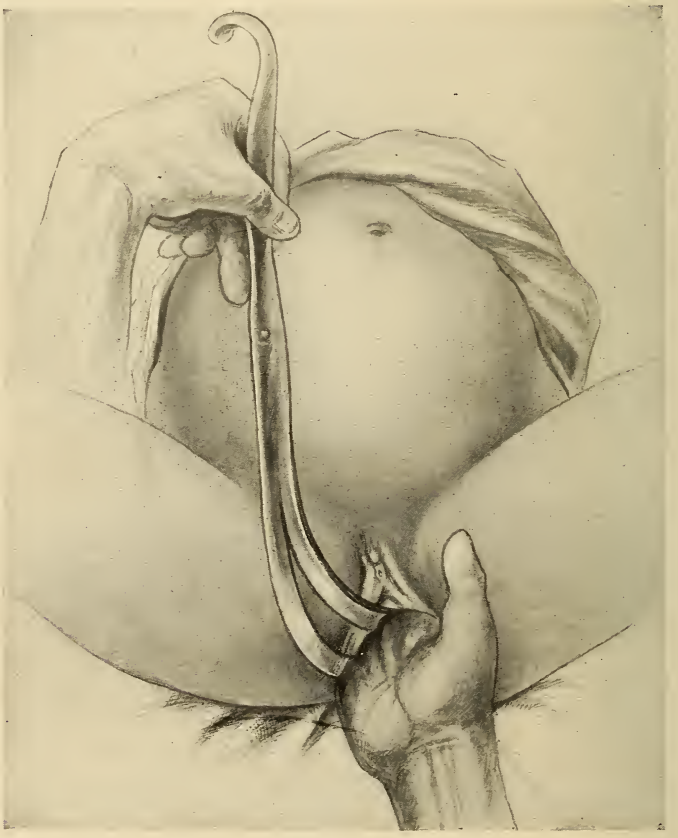


Fig. 348.—Introduction of left blade.

is recognized by the fact that he grasps the handle in the full hand as one would wield an ice-pick (Figs. 349 and 350). In this way all delicacy of touch is lost and the operator is much more likely to inflict unnecessary traumatism upon the maternal structures.

The method of introducing the blades is important. Two fingers of the right hand are passed into the vagina to serve as a guide. The position of the head has already been determined and the chief business of the guiding fingers is to make sure that the blade passes within the cervix

(Fig. 351). Some writers advise the introduction of the entire hand, a procedure which in my experience is rarely called for and is certainly highly undesirable, especially if the patient is a primipara and the operator has a large hand. The tip of the blade is now passed into the vagina by

FIG. 349. FIG. 350.

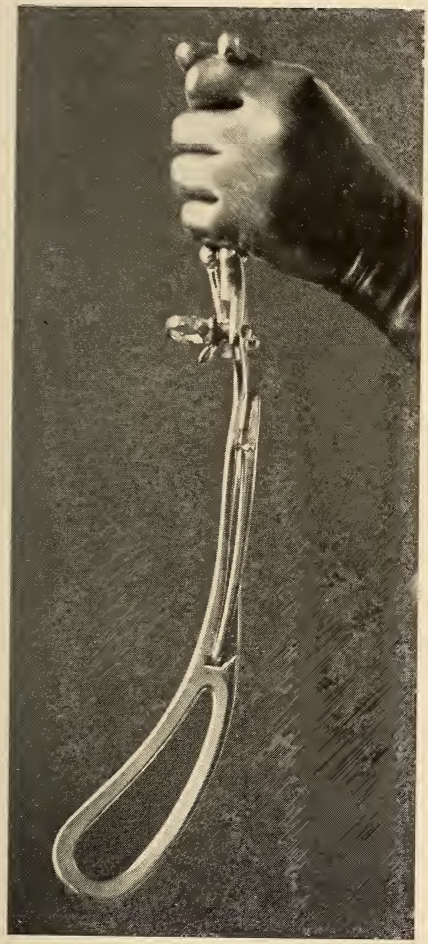


FIG. 349.—Incorrect method of holding the forceps blade during introduction.
FIG. 350.—Correct method of holding the forceps blade during the introduction. Only the tips of the fingers are used.

way of the posterior commissure and just a little to the left of the hollow of the sacrum. As the tip passes within the cervix, beyond reach of the fingers, the handle is depressed and carried with a rotary motion toward the patient's right side, when, if all is well, it glides into place without trouble. When the handle is horizontal at the vulva the introduction is complete.

The common mistake of the beginner is to present the tip of the blade at the side of the vulva and try to push it directly into place at the side of the head. I have often seen this result in several fruitless attempts, to the confusion of the operator and the disadvantage of the patient.

When the left blade is in position its handle is depressed, carried to the right and held in position by an assistant in order to make easier the introduction of its fellow. The operator, however, soon learns to dispense with the assistant in easy cases.

We come now to the introduction of the second blade, which is usually

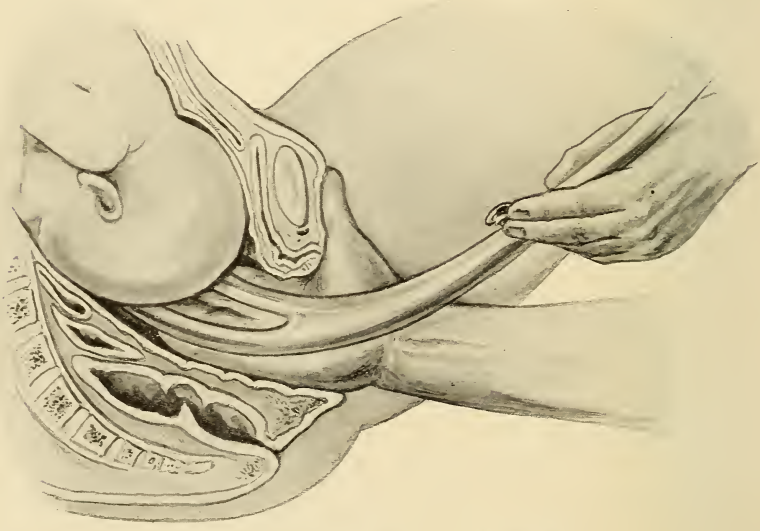


FIG. 351.—The guiding hand protects the cervix.

the right (Fig. 352). This is somewhat more difficult, owing to the presence in the vagina of the shank of the left blade, and hence there are usually more lacerations of the right side of the vulva and vagina after forceps operations than of the left. This difficulty is overcome and maternal traumatism minimized by introducing the tip of the blade "flatwise" above the shank of its fellow, and passing it as nearly as possible into the hollow of the sacrum, whence it can be rotated to a position opposite the first.

Locking.—In the low operation the occiput has rotated under the symphysis, or at least has descended so far that its rotation is completed during the locking of the blades or at the first traction. The sides of the head coincide with the sides of the pelvis and the second blade falls naturally into place. If, however, the head is very large or has been much moulded, there may be some difficulty in this respect, and such difficulty is quite often encountered in the median and high operations.

The trouble is most often due to the fact that the second blade has not been adjusted to a position opposite its fellow. In this case the *tour de spire* may be practised, or the blade gently urged into place by the fingers in the vagina. In other cases one blade may not have been introduced quite as far as the other. If neither of these causes obtains, locking may sometimes be effected by carrying the handles backward against the perineum and at the same time rotating them outward. In other

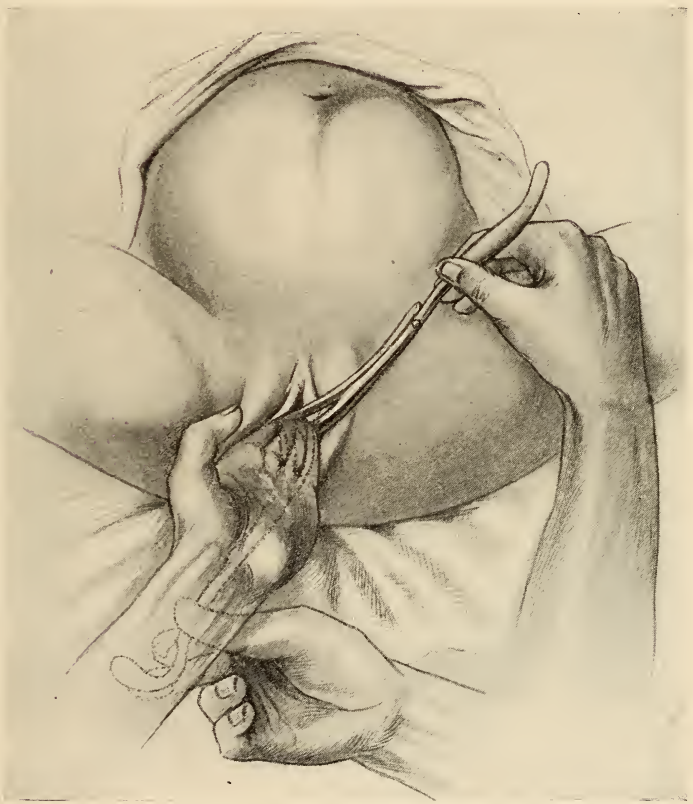


FIG. 352.—Introduction of right blade. An assistant holds handle of left blade out of the way.

cases a change of instrument may solve the question, *e.g.*, an instrument with a moderate pelvic curve is not as easily locked when the head is at or near the pelvic brim, and a well-marked pelvic curve makes locking at the outlet a more difficult matter.

As soon as the instrument is locked, and while the first traction is being made, the fetal heart should be auscultated. This practical suggestion, emphasized by DeLee, is of great value, for it occasionally happens that a prolapsed cord, or a cord encircling the neck, is compressed by the tips

of the forceps. If this pressure is long continued the child is promptly asphyxiated. If the heart-sounds, which were normal before the application of the forceps, become faint or disappear when the forceps are closed, and before much traction is made, the instrument should be removed and carefully reapplied under the guidance of the fingers or half-hand, which should endeavor to locate the cord and push it out of the way.

Tractions.—The first traction is tentative and made with one hand, while a finger of the other hand applied to the occiput notes that the head is advancing and that the forceps are not slipping. Tractions should be made at intervals of two or three minutes in imitation of natural labor, and should not as a rule exceed one minute in duration, thus avoiding prolonged compression of the fetal head. Between tractions *the grip upon the forceps should be loosened and the handles separated* and allowed to remain separate until the next traction; another method of limiting compression of the fetal head.

One or two horizontal tractions suffice to give the operator his bearings and to bring the occiput well under the pubic arch. What remains is to accomplish, with the forceps, the extension of the head. This is done by the so-called pump handle traction. The operator standing at one side of his patient manipulates the forceps with one hand, while the other hand at the vulva guides and controls the action of the forceps and estimates the distention of the perineum. Extension of the head is produced by depressing the handles toward the mother's abdomen. Here they occupy an almost horizontal position, and if the forceps have a marked pelvic curve may even come into contact with the abdomen, thus interfering somewhat with delivery. The head is then flexed by reversing the movement and bringing the handles to a position approaching the perpendicular. In this way the head is alternately flexed and extended in imitation of the natural mechanism, a larger and larger segment appearing with each flexion of the head, until the operator judges that there is sufficient distention of the perineum to permit the easy passage of the head. The usual mistake of the careless or incompetent operator at this time is to bring the head horizontally and rapidly through the vulva. In this way extensive lacerations are often produced and even in simple and easy cases irremediable harm may be done.

The operator should remember that very little compression of the handles is necessary at this time and he should on no account neglect the examination of the fetal heart. This is especially true in the case of elderly primiparæ with small and rigid soft parts.

Shall the forceps be removed during the delivery of the head? There has been much discussion over this point. My own conclusions are as follows: If the patient is a primipara, and the adaptation is close, it is better to remove the forceps and to complete the delivery by the method described in connection with the management of labor. This is especially true when the Tarnier instrument is used, since the blades of this instru-

ment are somewhat larger and heavier than those of other models. In the case of a multipara, however, or in any case in which there is plenty of room it is more convenient, and probably better practice, to allow the forceps to remain in position until with the delivery of the head the instrument falls of its own weight into the hand of the operator.

Pendulum Tractions.—Some teachers advise a side to side movement of the forceps in traction, the so-called pendulum movement. Others vigorously condemn the practice as unnatural and dangerous. My own belief is that such tractions are never justifiable when the head is high in the pelvis, and seldom justifiable at any stage of labor. Experience, however, has taught me that when the head is blocked at the pelvic outlet and direct tractions are without result, moderate and limited lateral movements may overcome the difficulty. Instances of this kind are found in cases of unusual size of the fetal head and of moderate contraction at the pelvic outlet. Here, as elsewhere, clinical experience must outweigh preconceived ideas and theoretical considerations however plausible.

The Median Operation

This is more difficult than the low operation, and if the head is large, or the position unfavorable, may tax the resources of a good operator. The head is in the pelvic cavity behind the symphysis, and must be brought to the floor of the pelvis before horizontal tractions can be made. Another difficulty is that the head has not completed its movement of rotation. It occupies one of the oblique diameters of the pelvis or perhaps it is still transverse.

The application is somewhat more difficult. If the forceps are to be applied to the sides of the head they must also occupy one of the oblique diameters. Let us suppose that the position is L. O. A., the most common one. Here the left blade is introduced in the usual manner but instead of being brought to the side of the pelvis, as in the low operation, it is left in the sacro-iliac articulation at the side of the head, *i.e.,* over the posterior ear of the fœtus. In difficult cases the ear may be located by the half-hand in the vagina. The right blade is next introduced as already described, but instead of being left at the side of the pelvis, as in the low operation, it is carried farther forward until it occupies a position opposite its fellow. This is the *tour de spire* of Madame LaChapelle. It is accomplished by lowering the handle, carrying it toward the left buttock of the mother, and at the same time rotating it slightly upon its axis. This movement is not always easy of accomplishment, and may occasionally require the aid of the guiding fingers in the vagina, gently urging the blade along. When the instrument is locked its concavity looks forward and to the left, *i.e.,* toward the occiput.

But the head is still behind the symphysis. Horizontal tractions are out of the question. We cannot make traction in a curve. How then are we to get the head around the symphysis? If the old forceps model is

used there are two means at our disposal. One is to carry the forceps handles as far back as the perineum will permit and make gradual and intermittent traction. The other is to practise the manœuvre of Pajot. In this manœuvre the operator seizes the forceps with one hand in the neighborhood of the lock and makes pressure directly downward, while with the other he grasps the handles and makes horizontal traction. Neither of these methods is ideal, though either may work well in an easy case. In the first a long time is required to bring the head to the floor of the pelvis and a large part of the force used is worse than wasted since it involves injurious pressure upon the maternal tissues behind the symphysis. The latter is a clumsy and imperfect imitation of the axis-traction principle, and involves severe compression of the fetal head. If one does not use the axis-traction model, some modification of Pajot's method is to be preferred; but the operator should be content with a gradual advance and should strive to limit the compression of the fetal head to a minimum.

How should the forceps be held? It has always seemed to me an absurdity to formulate precise rules as to how the forceps should be grasped, and to expect all men to hold the instrument in exactly the same manner. I think this is shown by the fact that good operators of large experience have different methods of holding the instrument. Indeed, most men find it convenient to change the grasp of the handles occasionally during the course of the operation. This of itself proves that there is no one method to be followed by every one and at all times.

In operating without the axis-traction model it is impossible always to be sure that one is pulling in the right direction, and if progress is not satisfactory one should change the direction of the tractions and watch the result. A common error of the inexperienced operator is to raise the handles too early, *i.e.*, before the occiput is well under the pubic arch. Tractions are made at intervals in imitation of normal labor. The operator should keep his elbows close to his sides and use only his forearms in pulling. To use the weight of the body is a relic of barbarism. It is better that the operator should sit at his work rather than stand. The temptation to use force is not so great, and the operator being more at ease can better concentrate his attention upon his work.

In all difficult cases pressure applied to the fundus is of greatest assistance.

Personally, I believe that the Tarnier instrument should be used in median operations. I believe that *it is a great mistake* to limit its employment to the high operation, as is so often advised; or at least taken for granted. Experience has taught me that by its use the head can usually be brought to the floor of the pelvis with much less exertion and trouble on the part of the operator, and, what is more important, with much less maternal traumatism and less compression of the fetal head.

Forceps in the R. O. A. Position.—Here the sagittal suture is in the left oblique diameter and the forceps, if they are to lie at the sides of the

head, must be applied in the right oblique diameter. The application is the same, *mutatis mutandis,* as in the L. O. A. position with this important exception. The right or posterior blade must be introduced first, because the presence of the left blade rotated anteriorly would make the introduction of the right blade difficult or impossible. After the blades have been introduced it will be found that locking is impossible, as the handle of the left blade is in front of that of the right. This difficulty, however, is readily overcome by rotating the handles around each other, the *decroisement* of the French writers (Fig. 353). The handles are seized each in the

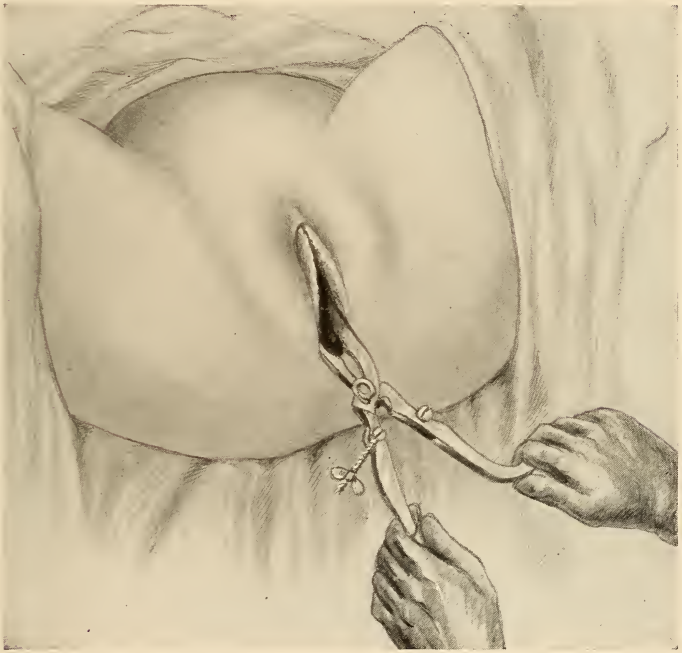


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FIG. 353.—Locking of forceps made possible by rotating handles around each other. (After Williams.)

full hand and gently drawn in opposite directions until the right one can be carried around and above the left. There will, as a rule, be no further trouble in locking.

Many students and practitioners, who have been incorrectly taught at the outset, seem to regard this passing of the anterior blade first and the subsequent rotation of the handles as an impracticable refinement. It is, however, easier than the ordinary method.

The entire manœuvre is rather difficult to explain on paper, and the reader is advised to test the matter on the manikin, or to observe application carefully in his next case. It is an indispensable part of the forceps

operation as practised by modern obstetricians and is especially useful in L. O. P. cases.

Forceps in Transverse Position.—In the transverse position the sagittal suture occupies the transverse diameter of the pelvis, and if the forceps are applied to the sides of the head they must be applied in the anteroposterior diameter of the pelvis, *i.e.,* with one blade behind the symphysis and the other in the hollow of the sacrum. This application is advised by some writers, while others say it is impossible. I know that it is possible, because I have myself performed it, but I do not advise its general use. If the pelvis is contracted, or the head of unusual size, there is considerable danger of injury to the maternal soft parts. As a rule, it is better to convert the position into an oblique one manually before applying the forceps. If this cannot be accomplished the forceps should be applied in an oblique diameter of the pelvis. If the occiput is directed to the left, the forceps are applied as in the L. O. A. position, *i.e.,* in the right oblique diameter. If it is directed to the right the application should be as in the R. O. A. position. One blade will then lie over the mastoid region, while the other is placed over the temporal region of the other side. This application has, of itself, a tendency to promote anterior rotation of the occiput.

Cases in Which the Forceps Cannot be Applied to the Sides of the Fetal Head.—It is easy for the writers of text-books to lay down exact rules for the application of forceps and to assume that these rules are applicable to every case. In actual practice, however, we sometimes meet cases in which it is not possible to make an exact cephalic application. In my experience these are usually cases in which the head is unusually large, or in which there has been much moulding and a long caput is present. In such instances, even if the first blade is correctly applied, it may be difficult or impossible to rotate its fellow to a position exactly opposite. If unable to make an exact cephalic application we should make the application as oblique as possible. Several trials may be necessary before we can make any application at all, and moderate force may be necessary in locking. In such cases the Tarnier forceps will often succeed when other instruments fail.

The High Operation

If the head is above the brim and cannot be made to engage by suprapubic pressure, the forceps operation is usually contra-indicated. In some instances, however, pressure over the fundus transforms such a case into one which may be delivered by a median or even a low operation. I have many times known this to succeed. The cervix should be dilated, the membranes ruptured and the bladder empty. I recall a recent case in which the head was above the brim of the pelvis. The patient was a primipara. I had failed to secure a good application with either the Elliott or the Tarnier forceps and feared that I would be obliged to

resort to version, with possible loss of the child. Before attempting this, however, I instructed my assistant to make strong pressure over the fundus. To my great satisfaction the head descended to the floor of the pelvis and the subsequent extraction was easy.

In most high cases a segment of the head has entered the brim but the greatest diameter still remains above. Here we must be content with an oblique application, since an exact application to the sides of the head makes delivery a mechanical impossibility.

The blades should be introduced as in the median operation, though of course they enter the birth canal more deeply. Tractions should be careful and tentative and never pushed to the extent of brute force. Expedients that may be tried are putting the patient in the Walcher position and turning her upon the side. If the old model of forceps is used, Pajot's manœuvre may be tried, the hand at the lock making pressure directly downward, or tractions may be made as far backward as the perineum will permit. Pressure from above may prove very useful. To undertake a high or a difficult median forceps operation without the axis-traction instrument is like treating a case of diphtheria without antitoxin. If a few tractions do not result in the advancement of the head, the forceps should be removed and some other method of delivery adopted. As I have often demonstrated, a careful attempt of this kind does not necessarily injure the fœtus.

The high forceps operation is to be regarded not as an operation that once begun must be finished at any cost, but as an alternative to version or some other method of delivery. It is to be regarded as a means of diagnosis, a test of the operability of the case in hand.

It is of the greatest importance that the obstetrician should be able to recognize those cases that cannot be delivered by the forceps. Fruitless attempts at delivery in these cases may not only seriously injure the mother, but are almost certain to prevent the subsequent delivery of a living child. If with a good application three or four tractions have no effect whatever, it is unlikely that further effort will do good, and if it does no good it is certain to do harm. The experienced obstetrician who has seen a few of these cases soon learns to recognize a certain stony immobility, an absolute lack of response to traction, that characterizes the inoperable case. Cases in which a satisfactory application cannot be made after two or three trials, in which the instrument persists in slipping, or in which locking is impossible without the use of great force, belong in the same category.

The Axis-traction Forceps

It is self-evident that ideal traction, *i.e.,* traction that is always in the axis of the pelvic canal, cannot be made with the ordinary forceps. Much of the force is wasted in pressure against the symphysis; indeed, it is worse than wasted, since it involves traumatism of the maternal tissues. This

fact has long been recognized, and in the early part of the last century attempts were made to correct the deficiency by giving the handles an extended backward curve. Hermann, in 1844, devised an axis-traction instrument which was correct in principle, but which was not adapted to practical use. Chassaigny, of Lyons, clearly appreciated the principles of traction *au centre de figure* and devoted a large part of his life to its study, but used tapes instead of traction handles. It was reserved for Tarnier to devise in 1877 the first really effective and practical instrument.

The construction of the axis-traction forceps is best appreciated by a glance at Fig. 354, which represents the latest modification of the Tarnier instrument. Traction is made not upon the true handles (*A*), as in the

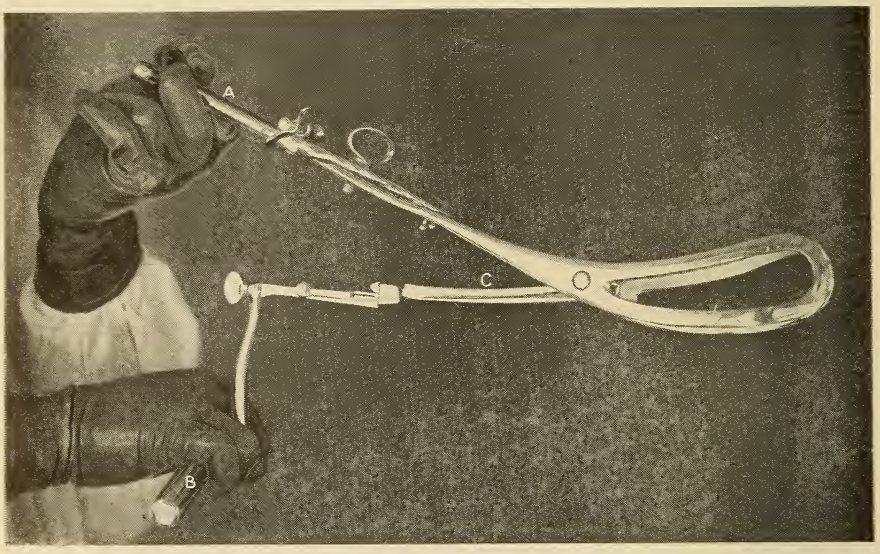

Fig. 354.—Latest modification of Tarnier forceps.

ordinary operation, but upon the traction handles (*B*), which are connected with the traction rods (*C*) by a series of movable joints. Thus, the handles proper swing free in the pelvis and indicate the direction in which traction should be made, while the head, its movements in no way restricted or controlled by the operator, moves automatically in the direction of least resistance, going through the movements of rotation and descent as in normal labor. I am strongly of the opinion that this is fully as important as traction in the axis of the pelvic brim.

With the ordinary instrument the operator is as likely to oppose as he is to favor the normal mechanism of labor, and is obliged to pull very much harder. In pulling harder he must compress the fetal head proportionately, and the danger to the child is enormously increased.

With the Tarnier instrument there is usually very little compressive

force exerted; first, because the instrument is so constructed that the blades do not readily separate, and second, because so little traction force is necessary, one hand often being sufficient to do all the work. For these reasons it seems to me that the axis-traction forceps should be employed in all difficult median operations as well as in the high operation, and I firmly believe that this would save the lives of many children.

The movable joints connecting the traction rods with the traction handle enable the operator to hold the traction rods horizontally when the head is seized obliquely or even when the application is transverse. This feature is, I believe, peculiar to the Tarnier model.

Technic.—The axis-traction instrument may seem a little complicated at first, but after using it once or twice all difficulties vanish. Correct descriptions and illustrations, however, are rare. In the following description it is assumed that the Tarnier instrument is used. It is sold in New York in three sizes. I am accustomed to advise my students to secure the largest. The difference is chiefly in the length. I also advise them to avoid substitutes that are recommended as lighter and presumably safer. I have tried elsewhere to show the fallacy of the idea that a forceps that is short and weak is therefore a safe instrument. In reality it is not a whit safer, but is really more dangerous, because far less efficient, and in some cases quite useless. This is particularly true of the axis-traction model. When the axis-traction forceps is used, it is because the case is a difficult one, and to select an instrument that is short and weak is to defeat the very object for which it is employed.

The instrument is applied in the usual manner, the blades being adjusted to the sides of the head, as in the ordinary operation. The traction rods are then loosened and attached to the traction handle. The fixation screw, sometimes improperly called the compression screw, is then screwed up, *just enough to keep the blades from separating and no more.* Most directions are incorrect upon this point. It is a fatal error to use the screw as a compressor. In this way one of the chief advantages of axis-traction, the absence of head compression, is nullified. No compression is necessary. In fact, if one forgets to use the screw at all, the forceps, if correctly applied, will not slip under any ordinary traction. The length and solidity of the blades in the Tarnier model, and the fact that the French lock holds them solidly in position, are the factors that prevent slipping.

Tractions are made at intervals, as with the ordinary instrument. Between tractions the fixation screw is loosened, and the handles separated, in order to avoid the possibility of compression.

The traction rods and the whole traction apparatus are kept as close to the handles proper as is possible without touching them. The handles then swing free, and afford an index, not only of the progress of the head, but also of direction in which traction should be made upon traction handles. As the head descends to floor of pelvis and handles rise, the traction rods are made to follow them, never touching them, however (Fig. 355).

A common mistake of the beginner is to use the traction apparatus to push up the handles. Another, and a more serious mistake, is to depress the traction handles with the idea that he is pulling in the axis of the superior strait. This is a gross error and may result in the slipping of the forceps, with serious consequences (Figs. 356 and 357).

The operator should satisfy himself occasionally that the rising of the

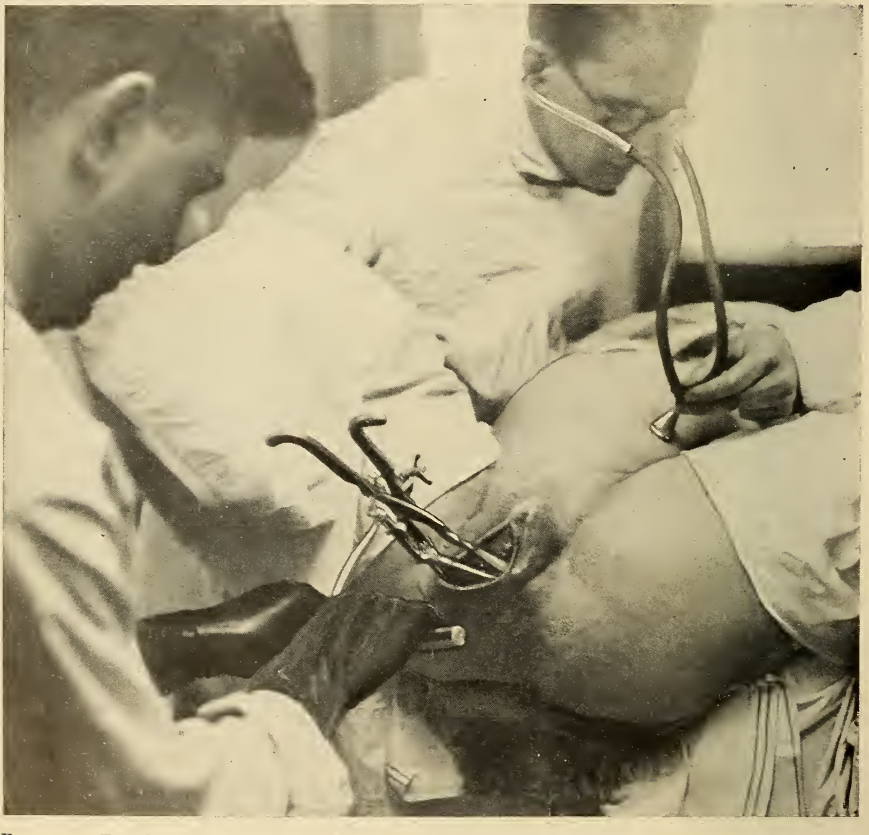

FIG. 355.—Traction with the Tarnier forceps. Note that the handles are rising, showing that the head is moving down.

handles is not due to slipping. For this purpose one finger palpates the head, while traction is made with the other hand.

When the head is well down on the pelvic floor, most operators remove the axis-traction attachment and complete the extraction without it. This is not always necessary since, as has been shown by the Edinboro school, the axis-traction principle works as well at the outlet as anywhere else. There are cases, however, in which the Tarnier instrument, owing to its marked pelvic curve, does not serve as well at the outlet, and progress is

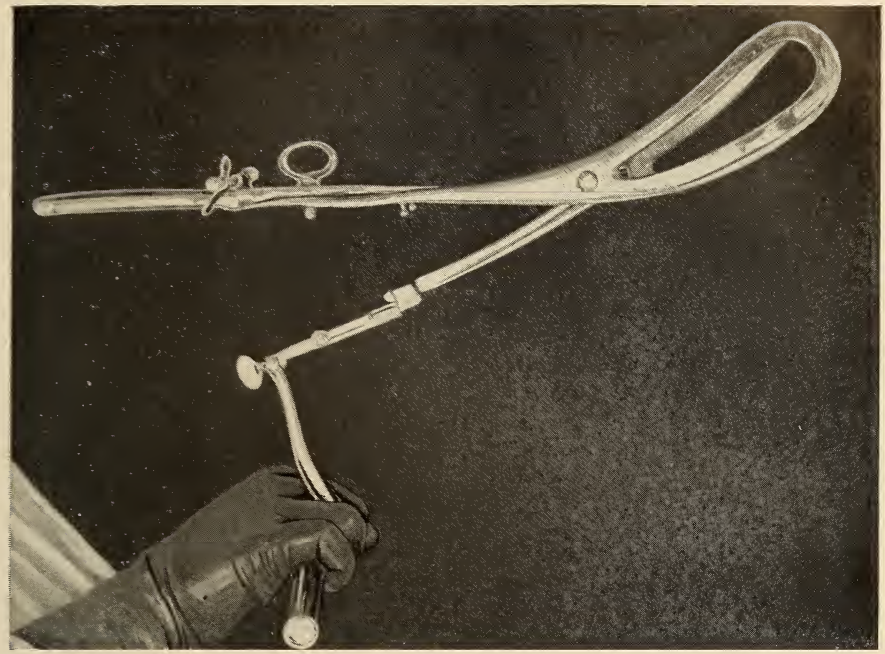

FIG. 356.—Incorrect method of making traction. The operator has depressed the traction handles with the idea that he is making traction in the axis of the superior strait. A dangerous blunder.

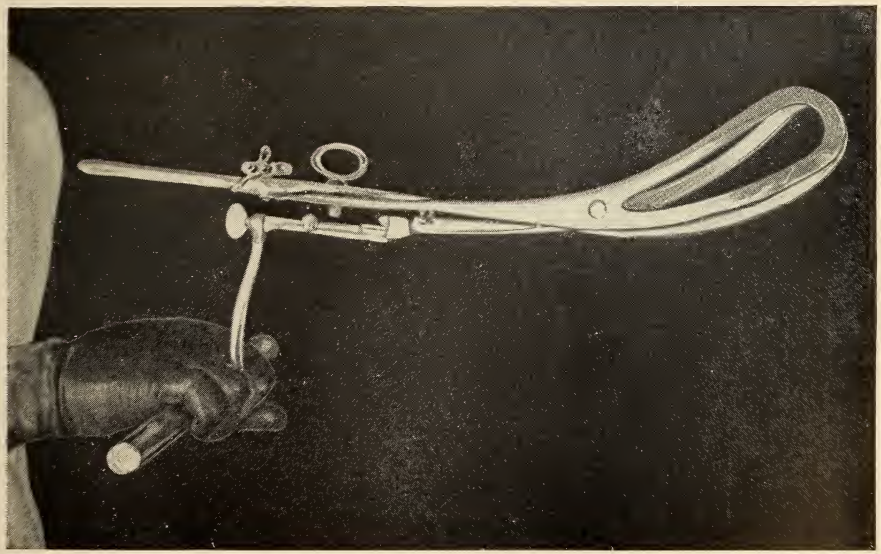

FIG. 357.—Correct method of making traction with the Tarnier forceps. The traction rods are approximately parallel with the shanks.

delayed. By replacing the instrument with an ordinary forceps having a very moderate pelvic curve delivery is easily effected. Such an instrument is, as already noted, much more convenient in bringing the head through the vulva.

Forceps in Posterior Positions of the Occiput.—If the head is at the brim and the occiput posterior, version is ordinarily indicated. The high forceps operation is sufficiently difficult under normal conditions. Even

FIG. 358.—Same case. Traction apparatus has been removed and the head is being delivered as in the ordinary operation.

if the head has become engaged, and its greatest diameter is a little below the brim, delivery with the ordinary forceps is a difficult and dangerous task and, if the operator has only such an instrument, version, if practicable, is still the operation of choice. If he has a good axis-traction instrument he can probably succeed, provided the head is not of unusual size. At all events a cautious attempt is justifiable.

In the majority of cases the delay occurs at the pelvic floor. If the cause of delay is unrecognized and the operator attempts to deliver the case in the usual manner, he may find delivery difficult or impossible. If he

succeeds it may be only after prolonged and severe traction. If the head is large the fœtus may be lost and the mother subjected to severe injury. I have seen lacerations of the third degree.

Forceps should not be hastily applied in these cases, since rotation often occurs at the last moment and contrary to all expectation. In some cases, however, suffering is severe or exhaustion is threatened, or perhaps the fœtus gives evidence of impending asphyxia. What is to be done?

Let us take the R. O. P., the most common of the posterior positions. The fetal head occupies the right oblique diameter, the same diameter as in the usual L. O. A. position. The forceps, then, are applied in the left oblique diameter, as in the L. O. A. position, but the tips now look toward the position of the head, introducing the half-hand and locating the posterior ear, if necessary, before applying the left blade. The right blade is then introduced and rotated to a position opposite its fellow.

The forceps having been locked, the next step is to raise the handles, thus flexing the head, since, as we have already learned, there is always more or less extension of the head in these cases. This movement causes the handles to point toward the left thigh of the mother. A straight forceps would perhaps be the ideal instrument here, since the operator would then have but one curve to bear in mind. When, however, the handles of the forceps have been carried toward one thigh of the mother, the curved instrument becomes "to all intents and purposes a straight forceps for the time being" (Brodhead)

Moderate traction is now made, and at the same time a rotary motion is imparted to the handles, which are carried to the mother's left. This manœuvre brings the occiput to the right. One or two such tractions usually suffice to bring the occiput to a transverse position. After each traction the head is held in its new position for a minute or more without, however, making much compression until a contraction occurs or another traction is made. In this way time is given for the rotation of the body to follow that of the head, and the latter does not slip back to its former position. When the occiput has become anterior the forceps have become inverted and must be removed. Firm pressure upon the fundus now serves to keep the head in its new position and perhaps even to effect delivery. If not, the forceps are re-applied and extraction completed, according to the rules already laid down for the management of R. O. A. cases.

If the occiput is posterior and to the left, the procedure is relatively the same as that just described. Since the forceps are applied in the right oblique diameter it is easier and better to apply the right blade first, as in the R. O. A. position.

In practice all this is not as formidable as it seems. It is necessary, of course, that the operator know how to make a diagnosis of position, and that he understand the technic of the forceps operation, but that may be said, and with even more truth, of the high forceps operation. I recall that my first attempt proved much easier than I had expected. I do not

share the fear of this operation expressed by some writers. Indeed, I believe that it gives better results for both mother and child than forceps extraction with the occiput remaining posterior, which is usually the only alternative. If the operation cannot be easily performed it should not be performed at all. Forcible rotation is never justifiable (Fig. 359).

If a careful attempt at rotation fails, or if the occiput has rotated into the hollow of the sacrum, the head must be delivered with the occiput posterior. Horizontal tractions should be kept up until the forehead appears beneath the symphysis. This is the most important thing to be remembered in these cases. The operator should work carefully and patiently, meanwhile carefully watching the fetal heart. The mistake of the inexperienced operator, or of the man who has failed to make a diagnosis and thinks he is dealing with an anterior position, is to raise the handles too soon. This, of course, delays progress and causes undue traumatism of the tissues behind the symphysis and unnecessary compression of the fetal head. It is not until the forehead has escaped from beneath the symphysis that the handles of the forceps are slowly raised, thus flexing the head and lifting the occiput over the perineum. They are then depressed, causing the nose, mouth and chin to pass successively beneath the pubic arch, thus completing the delivery of the head.

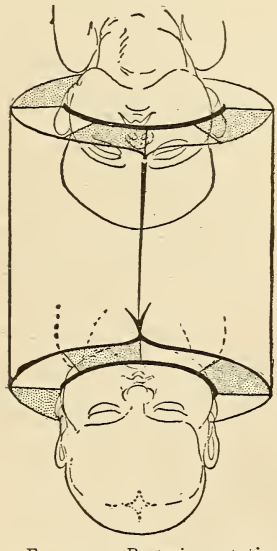

FIG. 359.—Posterior rotation of head into the hollow of the sacrum. Engagement in antero-posterior diameter and descent without rotation.

Anterior rotation of the occiput by means of the axis-traction forceps is a favorite method in France. The forceps are applied as in the method already described, and the handles are raised in order to produce flexion of the head. The operator then makes traction upon the rods with one hand while with the other hand he rotates the handles proper.

I have frequently rotated the head in this manner, after having brought it to the floor of the pelvis by means of the Tarnier instrument. In the majority of cases, however, the head is already at the pelvic floor when the necessity for interference arises, and in these cases the operation already described is simpler and more easily performed (Figs. 360 and 361).

Forceps in Breech Presentation.—The application of the forceps to the breech may occasionally be called for. The indications are given in the chapter on breech presentations. The Tarnier instrument is to be preferred, and an exact bitrochanteric application secured. This is easily accomplished, since the breech does not fill the pelvic brim, and the blades are easily urged or guided into position. The hold over the trochanters

is secure and least likely to injure the fœtus. Tractions should be intermittent and gentle. If too much force is used the forceps will slip and there is also increased danger of injuring the fœtus. Strong pressure upon the fundus should be kept up during the tractions. Sometimes moderate continuous traction is of advantage. Of course, there is not the same danger from compression as in cephalic presentations.

As soon as the breech has been brought down into the pelvic cavity the forceps should be removed and the remainder of the delivery conducted as in any breech presentation.

Forceps in Face Presentation.—In a face presentation at the pelvic brim version is the operation of choice. In face presentation with chin

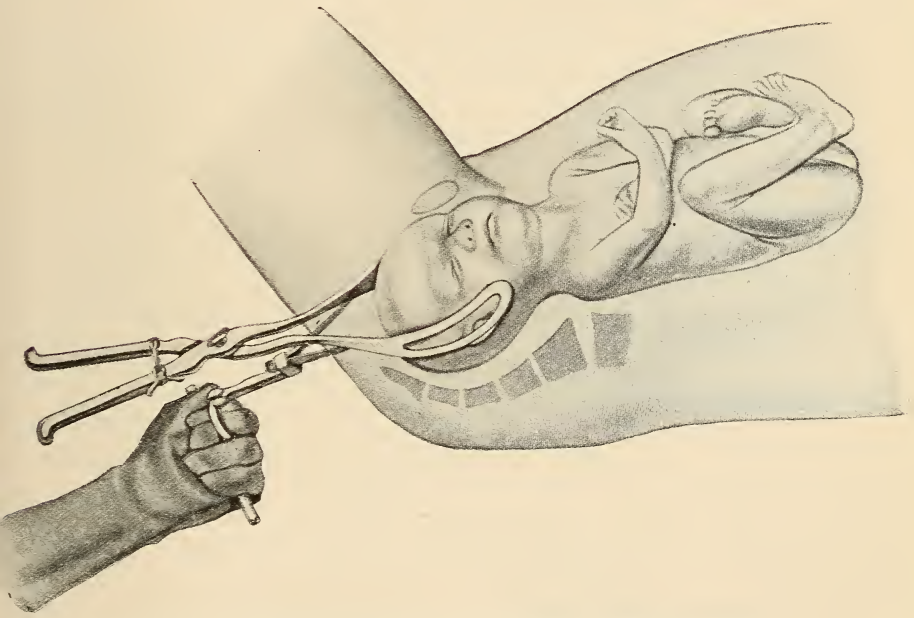

FIG. 360.—Application of forceps in R. O. P. position. Head poorly flexed.

anterior and the head low in the pelvis the use of the forceps may become necessary. An exact application to the sides of the head is of the greatest importance; first, to prevent pressure upon the child's neck, and second, to prevent slipping. The forceps penetrate more deeply than in occiput presentations owing to the long occipitomental diameter which they must cover. The rotation of the chin under the symphysis is cautiously encouraged by imparting a rotary motion to the forceps during traction. When the chin has rotated under the subpubic arch, the handles are gradually raised and the head is born by a movement of flexion. During the period of expulsion the trachea is pressed against the subpubic arch. The operator should guard against this by not raising the handles any more than is

absolutely necessary and by hastening delivery as much as is consistent with prudence.

If the position is transverse and immediate delivery indicated, an effort

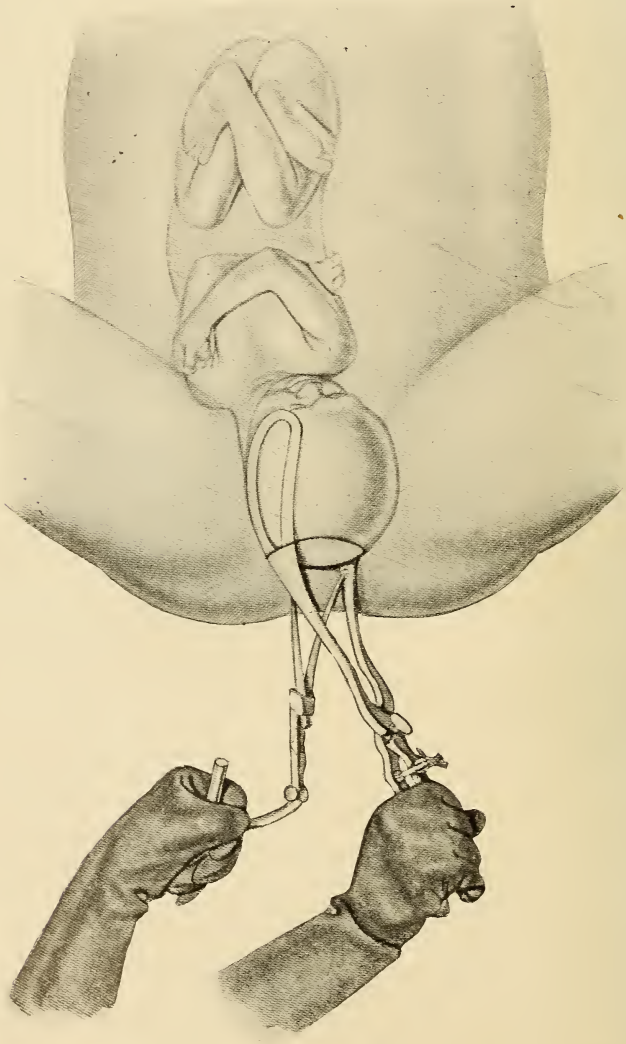

FIG. 361.—Application of forceps in R. O. P. position. Flexion produced by raising the handles.

should be made to rotate the chin to the front by the hand before applying forceps. The instrument is highly dangerous to the fœtus in the transverse position, since one is likely to compress the trachea. Even if one tries to

apply the forceps to the sides of the head one is apt to make an oblique application in the end. Fabre advises that if forceps are used those with short blades should be employed as less likely to press upon the child's neck.

If the chin is posterior, and the head of normal size, forceps are contra-indicated, since extraction is impossible. It is better as a rule to try to pass the second blade directly into position, since the irregularities and projections of the face make the *tour de spire* a difficult matter (Fig. 362).

Forceps to the After-coming Head.—Shall the forceps be applied to the after-coming head? This question has been much discussed, and there is still lack of agreement. Personally, I have usually succeeded by the use of the Mauriceau method and have come to regard this as the most

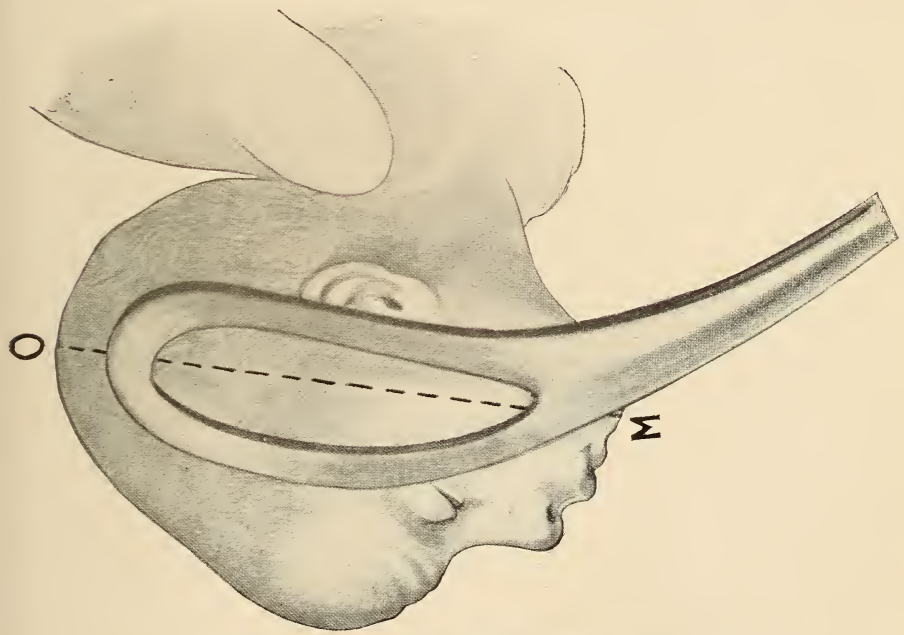

FIG. 362.—Application of the forceps in face presentation.

rapid and effectual of all methods. The factor of rapidity is most important here on account of the great danger to the child and an experienced operator can usually effect delivery in less time than it takes to apply the forceps. Nevertheless, in view of the testimony of many good operators that they have occasionally succeeded with the forceps, after the failure of other methods, it is wise to have the instrument sterilized and ready for use.

I do not believe that the use of the forceps above the brim is indicated, and I do believe that it is as hazardous to the mother as any other hasty

high forceps operation. There is, however, a class of cases in which the head is delayed after passing the brim of the pelvis, and this in spite of shoulder and jaw traction and suprapubic pressure. In some of these cases the delay is due to insufficient dilatation of the cervix, in others to unusual size of the head or to an occipitofrontal diameter much prolonged by moulding. In others, perhaps, by a moderate contraction of the pelvic outlet, which has been allowed to pass unnoticed. I have never seen these cases described but have met them occasionally. It is in these cases, I believe, that the application of the forceps sometimes hastens matters.

The method of application is well shown in Fig. 363. The feet of the child are carried upward and backward over the mother's abdomen and the forceps passed along the abdominal surface of the child. They should be applied to the sides of the head if possible. One or two horizontal tractions should bring the chin under the symphysis. The handles are then raised, flexing the head and bringing face, forehead and occiput over the perineum. A forceps with a moderate pelvic curve is to be preferred, so that the handles will not strike against the child's body as they are carried upward. The operator should be careful not to compress the cord with a forceps blade.

After every median or high operation, and whenever the cervix has been manually dilated, the latter should be inspected, and, if necessary, repaired. Lacerations of the perineum and pelvic floor should also receive attention. Douches at this time are quite unnecessary and, I believe, do more harm than good. Nothing has been introduced into the uterus except the forceps blades, which are, or should be, sterile, and the flow of liquor amnii and blood, the latter being quite free in forceps operations, constitutes a sufficient irrigation. The usual time should be allowed for the expulsion of the placenta. Many seem to think that it is necessary to hurry the expulsion of the placenta after a forceps operation. This is a mistake and, as in normal labor, results in unnecessary blood loss. The latter is especially undesirable after a forceps operation, in which the patient always loses more blood than in normal labor, and in which the anæsthetic creates a tendency to hemorrhage. If there is no tendency to bleeding the usual time should be allowed for the expulsion of the placenta, the uterus being carefully watched meanwhile. After the delivery of the placenta it is a wise precaution to administer ergot and the fundus should be carefully watched for two hours.

Summary.—As the result of considerable experience in this field, I venture the following advice to those of my readers who are interested in this subject:

Every practitioner should have two pairs of forceps, one of which should be an axis-traction model, the other an instrument like the Simpson forceps, with a very moderate pelvic curve.

All short and weak instruments should be avoided.

All forceps operations should be performed upon a table.

FIG. 363.—Forceps applied to the after-coming head.

The use of the catheter as a final preliminary measure should never be forgotten.

Before any attempt to apply the blades, a final examination for diagnosis should be made.

Prolonged and profound anæsthesia should be avoided.

Do not give too much of the anæsthetic or give it too long.

The forceps handles should always be separated between tractions.

The frequent auscultation of the fetal heart should never be forgotten.

The forceps operation is the most important operation in surgery. Two lives are at stake. Such an operation should be carefully and frequently rehearsed. Whenever possible, it should be performed under the most favorable circumstances. He who intends to practise obstetrics should learn the principles of the operation and apply them from the start, and he who has become accustomed to careless and slovenly methods should discard his old habits and resolutely begin anew.

CHAPTER XXVIII

VERSION

Definition.—By version is meant the substitution of one pole or part of the fœtus for another at the pelvic brim. The object, of course, is to substitute a favorable for an unfavorable presentation.

Varieties.—There are three kinds of version. In cephalic version, the head is made to present; in podalic version, the foot; and in pelvic version, the breech.

Methods.—There are also three methods of performing version—the external, the internal, and the combined. Internal version requires the introduction of the hand into the uterine cavity. In the combined, bipolar, or Braxton Hicks method, one or two fingers only are passed into the uterus, the external hand assisting at the fundus. In external version all manipulations are made through the abdominal wall.

Internal podalic version, since it is the most important and most frequently performed, will be first considered.

Internal Podalic Version

Indications.—In a general way it may be said that internal podalic version is indicated in all cases in which speedy delivery is necessary, and in which such delivery cannot without undue risk be accomplished by the forceps. Manifestly, the operation has a wide field of usefulness. In some cases, as in eclampsia, placenta prævia, and accidental hemorrhage, it is undertaken primarily in the interest of the mother; in others, as in prolapse of the cord, in the interest of the child. In the majority of cases, however, it is employed as the quickest and safest method of ending a situation that has become intolerable and threatens the safety of mother and child alike.

When the head is arrested at the brim in an unfavorable position, version is usually indicated. Examples of this are to be found in face and brow presentations, and in posterior positions of the occiput. Such cases are not suitable for the forceps, and theoretical and traditional methods of replacement are of little use; the latter, indeed, do far more harm than good in the majority of cases. When the head is at or above the brim and cannot be made to engage, version is usually much safer than the forceps operation, even though the position be normal.

In all cases of delayed first stage, in which there is apparently no serious mechanical disproportion, but in which the forceps fail and the child is living and viable, version is the operation of choice. Experience should soon teach the observant accoucheur when to lay aside the forceps in

these cases. Untold harm is often done by prolonged and forcible traction in cases that are unfavorable for the forceps but may be easily delivered by version.

In transverse presentation, we have, of course, an absolute and typical indication for the performance of version, and this is also true of many cases of prolapse of the cord. In general, however, the accoucheur will do better to bear in mind the general principles outlined above and to study carefully the subject of the choice between the forceps operation, considered in the last chapter, and version. It is only in this way, and not by attempting the impossible task of memorizing a long list of special indications and particular cases, that he will succeed in reaching a correct decision.

Contra-indications.—Version is usually contra-indicated when forceps delivery is practicable and not attended by great risk to the mother, because the forceps operation ordinarily involves far less danger to the fœtus. Even in easy versions the entrance of air into the uterine cavity, or the sometimes unavoidable handling of the cord, may cause premature inspirations, with resulting asphyxia, and when the fœtus is of large size there is often unexpected delay in the bringing down of the extended arms and the delivery of the after-coming head. It must be admitted, however, that the skill of the individual operator plays a large part. A good forceps operator, and especially one who is familiar with the axis-traction instrument, can often deliver easily with the forceps when another would be obliged to resort to version with possible loss of the child. It is also contra-indicated in cases of transversely or generally contracted pelvis, because in such cases the long occipitofrontal diameter of the fetal head is brought into relation with the shortened transverse diameter of the pelvis. A head of average size is not likely to be successfully delivered by version through a flat pelvis if the conjugate diameter is less than 8 to 10 centimetres.

Version is contra-indicated in the case of a hydrocephalic fœtus, and it should not be undertaken in the case of a dead fœtus unless the operation promises to be an easy one. It is never justifiable to subject the mother to a difficult version in order to secure the merely æsthetic advantage of delivering an unmutilated child.

It is, of course, contra-indicated when, after rupture of the membranes, the uterus is so tightly contracted about the fœtus that under full anæsthesia a knee or a foot can only be reached by the exercise of brute force.

The statement so often made, however, that version is highly difficult and dangerous when performed some hours after the membranes have ruptured is incorrect. It is often possible, and even easy, to perform version, hours, or even days, after rupture of the membranes, especially when the uterine contractions have been weak, or active labor has not supervened. If version is apparently indicated in such a case, its practicability should be determined, not by theoretical considerations, but by actual trial, by a cautious attempt under anæsthesia.

Another statement often made by those who write from an academic, rather than a practical, stand-point is that version cannot be performed when the head is low in the pelvis. This simply shows lack of experience. It is, of course, true that under such circumstances it is often impossible and usually contra-indicated. Nevertheless, there are occasional cases of this kind in which the forceps fail and the delivery of a living child seems doubtful. In such an emergency the only way of finding out whether a version is practicable is to try. A cautious attempt to lift the head out of the pelvis, always with the coöperation and guidance of the external hand at the fundus, does no harm and may succeed. Now and then the operator finds to his surprise and relief that the whole operation is performed without difficulty.

Finally, the student is often told that version should not be performed unless the cervix is fully dilated. This leaves him in a dilemma that is not only cruel but quite unnecessary. In many cases in which version is indicated, the head, because of some malposition, cannot descend. To wait for complete cervical dilatation would be to wait until both mother and child succumbed. When version is indicated, dilatation of the cervix is indicated and should be performed. But more of this when we come to speak of the cervix as an obstacle to delivery.

Technic.—The operation should be performed upon a table and with the usual aseptic precautions. A high table is preferable on account of the downward traction necessary. Special care should be taken to see that the abdomen is disinfected and covered with sterile towels, since the hand of the operator must be placed upon the fundus. The rectum should be empty and the patient should be catheterized. The effect of trying to express the after-coming head in the presence of a distended bladder can better be imagined than described. The catheter, so frequently left at home, is often the one instrument absolutely necessary. An enema should be given. A sterilized tape or fillet for securing a prolapsed hand may be needed, and a tenaculum, needles, needleholder, and sutures for repair of the cervix and perineum should not be forgotten. Full anæsthesia is necessary in version, especially in difficult version, since uterine relaxation must be secured, but the administration of the anæsthetic should be delayed until all other preparations have been made. In this way the dangers of shock, postpartum hemorrhage, and fetal narcosis are minimized. A competent assistant should be secured, if possible, to give the anæsthetic, and to watch the fetal heart.

Position of the Patient.—Many operators prefer to have the patient in the lateral position, and this position has certain undeniable advantages. In my opinion, it is better to begin with the patient in the lithotomy position, since in this position the anatomical relations are more easily remembered, asepsis can be more thoroughly maintained, and the after-coming head better managed. Moreover, in easy versions, it answers every purpose. If, however, difficulty is experienced in securing a knee

or foot, it may often be overcome by turning the patient upon the side. Of this I shall have more to say directly.

The knees may be held by legholders, but if two reliable nurses or bystanders can be secured it is better to have one hold each knee, since it may be necessary to put the patient in the Walcher position to facilitate the passage of the after-coming head, or to turn her upon the side. The Trendelenburg position is also occasionally useful, especially in those cases in which there is difficulty in dislodging the head at the pelvic brim. Nothing could be more illogical or unscientific than to adopt one position because traditional in some country or locality, and never deviate from it.

Preliminary Dilatation of the Cervix.—Except in certain cases of placenta prævia in which immediate delivery is not to be undertaken, complete dilatation of the cervix is an indispensable prerequisite to the operation. The advice sometimes given to wait for dilatation is futile. If version is indicated, dilatation is indicated. Indeed, in many cases, especially in malpresentation, dilatation will not occur, no matter how long one waits.

The largest size de Ribes bag that can be introduced is inserted and moderate traction made, or, if haste is necessary, manual dilatation is employed. When the cervix has been fully dilated, that is, so that four fingers can be introduced and separated, the fingers should be held in this position for a few moments, and the cervix allowed to contract upon them. Thus one not only dilates, but paralyzes, the cervix, and prevents recontraction. It should never be forgotten that an artificially dilated cervix has a tendency to recontract. The importance of thorough dilatation and paralysis of the cervix as a preliminary to version cannot be overestimated. Thus we prevent, or at least minimize, the danger of bad cervical tears. The cervix is not likely to be badly torn by a careful manual dilatation, but such a result is almost certain if the after-coming head is forcibly dragged through an imperfectly dilated cervix. Thus, too, we prevent a very embarrassing, and to the fœtus most dangerous, complication, the grasping of the fetal neck by a recontracting cervix. If the fœtus is to be delivered alive its passage through the cervix cannot be long delayed. Hence the too often forgotten fact that complete dilatation is even more important than in the forceps operation.

Choice of Hand.—All things being in readiness, the hand corresponding to the position of the fœtus, left position, left hand, and *vice versa,* or, in other words, the hand the palmar surface of which corresponds to the fetal abdomen, is well lubricated with lysol solution, and passed gently and carefully into the vagina, the fingers being so disposed as to form a cone, entrance being effected chiefly by backward pressure upon the perineum. Meanwhile the operator confirms his previous diagnosis of position and presentation, and notes carefully the size and shape of the pelvis and makes sure that the operation is really indicated. The membranes, if still intact, are ruptured, and the hand is passed directly into the

sac. This is preferable to rupturing the membranes at a higher level, since there is less danger of infection when the hand is kept from direct contact with the uterine wall, and especially the placental site. The head

Fig. 364.—Bimanual version in vertex presentation. Case of a multipara with flat pelvis.

is gently raised and pushed to that side toward which the occiput points, counter-pressure being made by the external hand at the fundus. It is a cardinal rule, *never to be forgotten,* that, throughout the operation, the external hand at the fundus should guide and control the movements

of the internal hand, thus preventing a dangerous strain upon the uterine attachments. As the head is pushed aside, the external hand presses the breech in the opposite direction, and as the internal hand passes upward, the operator observes whether the cord is pulsating regularly. In the case of a dead fœtus the operation, unless it promises to be an easy one, should be suspended. During uterine contraction all manipulations should

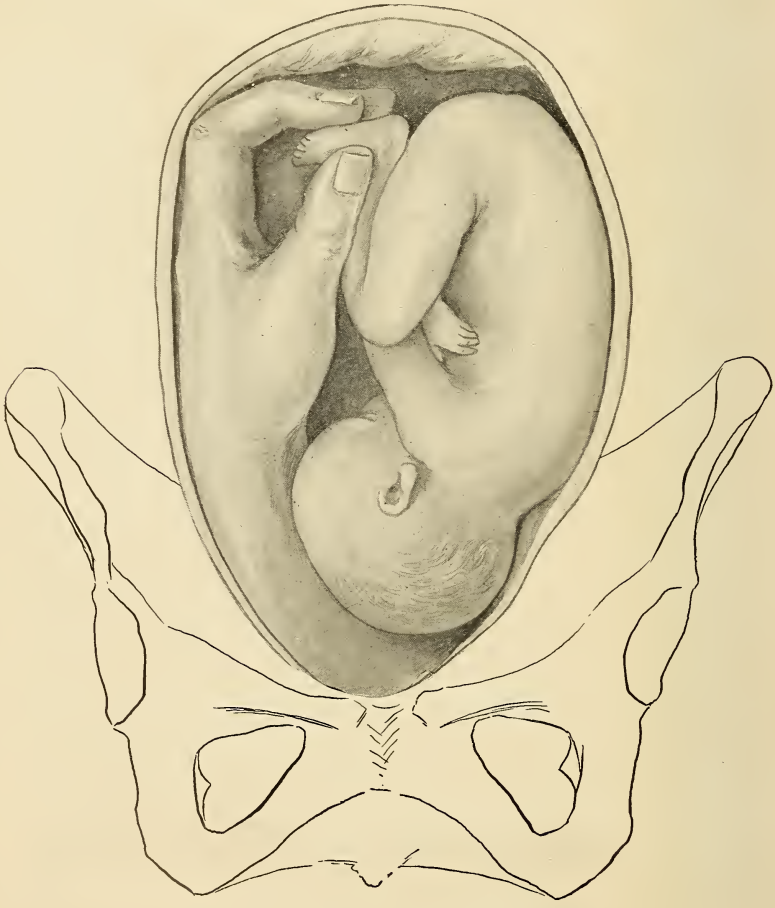

FIG. 365.—Bringing down foot the wrong way.

cease, and the fingers should be extended so that the hand will occupy as little space as possible.

FINDING A KNEE OR FOOT.—On finding his hand in the uterine cavity the beginner is apt to be embarrassed by what appears to be a multiplicity of small parts. He will be much aided by remembering that, contrary to the advice usually given, *the knee, not the foot* (Fig. 365),

is in vertex presentations the objective point. The knee is usually on a lower level than the foot, and is more easily reached and recognized. This is well shown in Fig. 366. Note that the knee points down, while the elbow points up. When the knee is reached and recognized, simple traction causes extension of the leg, and the hand sliding down grasps the foot.

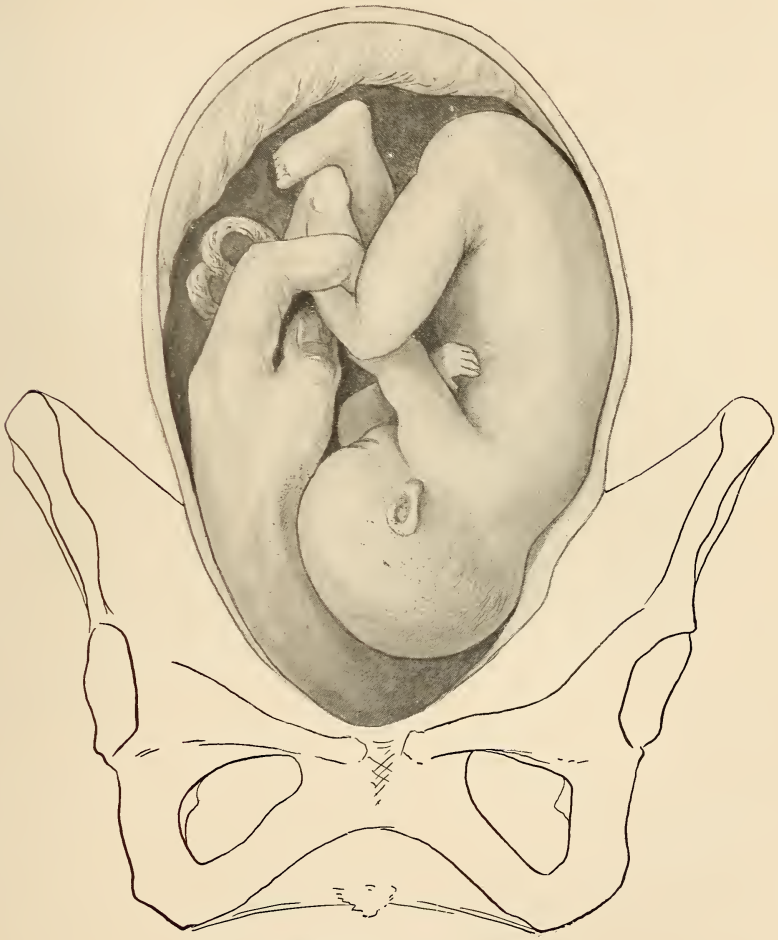

Fig. 366.—Bringing down foot the right way.

Many rules have been given for distinguishing a foot from a hand. In my opinion they are unnecessary. The heel, of course, is the peculiar mark of the foot, but it would seem that a man who, having in his grasp a fetal foot, could not tell it from a hand without specific rules, could not do so if he had the lost libraries of Alexandria at his disposal.

It is better to seize only one foot, since we thus leave a larger mass to

dilate and facilitate the passage of the after-coming head, and, in placenta prævia, to act as a tampon. In difficult cases, however, *e.g.,* in pelvic contraction, it may be necessary to seize both feet.

Choice of Knee or Foot.—It is much better to seize the anterior knee or foot if possible. The novice will be glad to get either, and having found one would, perhaps, be unwise to let it go, but as soon as he has acquired some experience he will—except in certain cases of transverse presentation, to be considered later—do well to seek the anterior foot in every case. For this choice there are three reasons:

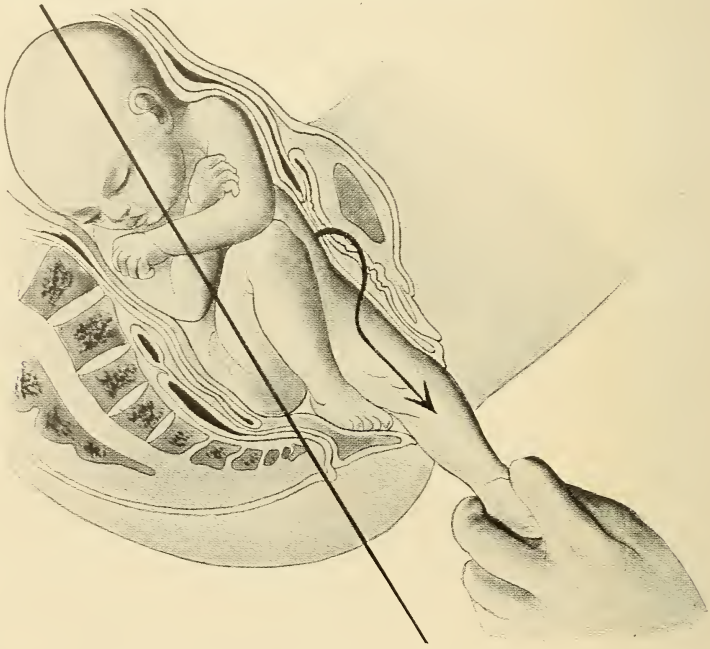

Fig. 367.—Traction correctly made on anterior foot.

1. Traction on the anterior foot promises forward rotation of the back (Fig. 367).

2. When traction is made on the anterior foot, the line of traction corresponds more closely with the axis of the pelvic brim.

3. In traction on the posterior foot, the anterior buttock may be caught behind the symphysis (Fig. 368).

Moderate traction usually suffices to turn the child and carry the head to the fundus. Version, however, is not complete until the knee appears at the vulva. The young operator should avoid the mistake of thinking that the bringing down of a foot necessarily means the dislodgement of the head and the completion of the version proper.

When is a version complete? Too often the beginner, and even the one

who ought to know better, takes it for granted that version is complete as soon as a foot appears at the vulva. It is quite possible to bring a foot to the vulva without dislodging the head from its original position. In this case the child has been simply doubled upon itself, and if the operator loses his head and attempts to extract the child by main force, much harm may be done. If he would be certain that version is complete he must deliver the leg as far as the knee. If this cannot be done without the use of force he should at once suspend the operation and determine the cause of delay. The treatment of this complication will be considered in a moment. In the meantime, let us remember version is not complete unless

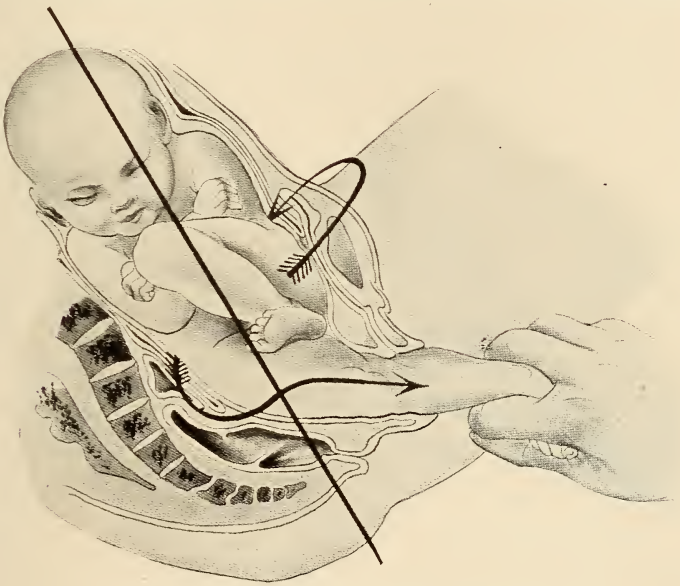

FIG. 368.—Traction is incorrectly made on posterior foot.

the leg can be delivered as far as the knee. If this cannot be done without the use of force the operation should be at once suspended and the cause of delay determined (Fig. 369).

As soon as the foot and leg have been delivered they should be wrapped in a warm sterile towel, and this also for three reasons:

1. To maintain the bodily heat of the fœtus.
2. To prevent premature inspirations due to the reflex action of cold.
3. Because the operator can make much more effective traction than when his hands grasp the slippery foot and leg of the fœtus.

Some teachers advise that when version is complete the danger has passed and extraction may be delayed. In my opinion this is a mistake. The fœtus may already have been more or less asphyxiated, and delay will result in increased fetal mortality. Moreover, the mother is exposed to the

added danger involved in a second anæsthesia and a second operation. Nor should we forget that, if we wait too long, the cervix may recontract.

As soon as version has been completed the fetal heart should be auscultated, and, if signs of asphyxia are noted, delivery should be hastened.

FIG. 369.—Bimanual version in vertex presentation. The hand *in utero* has brought down the anterior foot, which descends to the vulva while the other hand favors turning.

This precaution, so often neglected, is of the greatest importance. It is the height of folly to subject the mother to such an operation as version in order to secure a living child, and at the same time to neglect our only means of knowing the condition of the child during the progress of the operation.

Difficulties and Complications.—Now and then difficulty is found in displacing the vertex. Of course, if the head is wedged in the brim and cannot be moved by moderate force, the operation is contra-indicated, but such cases are rare. More commonly, the child cannot be turned, the head refusing to ascend even after it has been pushed to one side and the foot brought down into the vagina. In these cases two fingers in the vagina, aided by the external hand, may succeed. Both feet may be brought down that more efficient traction may be secured. The Trendelenburg position should be of service. The so-called combined method, by means of which the hand in the uterus pushes up the head while the foot is drawn down by a fillet, is obsolete and likely to lead to rupture of the uterus.

In some cases it is difficult or impossible to reach a knee or foot. As noted above, this difficulty may often be overcome by turning the patient upon her side. This expedient should never be forgotten. In the course of a difficult version for shoulder presentation every effort with the patient in the dorsal position having failed, I was able to secure a foot and deliver a living child by having the patient turned upon her side. I recall another case in which the same measure was successful and was obviously the means of saving the life of a patient. Unavailing efforts had been made to extract a perforated head and the patient, who had been previously subjected to an hour's forceps traction, was in a condition of marked shock. Version was tried, but proved ineffectual until the patient was made to assume the lateral position.

While the change from the dorsal to the lateral position is being made, the hand may remain *in situ*. It is well to place the patient upon the side corresponding to the abdominal surface of the child and, if not successful, to turn her upon the other side.

It is astonishing that so many students and practitioners are ignorant of this method, and that so many text-books make no mention of it whatever.

Now and then the uterus becomes tetanically contracted about the fœtus and even the introduction of the hand is difficult. In these cases full anæsthesia is of special importance. Efforts to pass the hand into the uterus should be tentative, and upward pressure intermittent and gradual.

If, after passing the head, the hand encounters the contraction ring, the greatest caution is indicated. The presence of the ring at this height indicates great stretching and thinning of the lower uterine segment and, consequently, imminent danger of uterine rupture. If the first cautious attempts are unsuccessful, it is the part of wisdom to desist, and to adopt some other method of delivery.

Version being complete, we have to consider what is ordinarily called breech extraction, although it might as well be called footling extraction. Except in rare cases of abnormality, the breech or trunk offers no resistance, difficulty being encountered only in the delivery of the arms, and of

the after-coming head. It is an essential part of the operation of podalic version, taken as a whole, and also, of course, of practically all kinds of internal or combined version, as well as of all breech presentations. It is one of the most important, and one of the most generally misunderstood, operations in midwifery, and deserves separate and careful consideration.

Breech Extraction

The patient should always be in the lithotomy position, with the hips well over the edge of the table, in order to permit that downward and

Fig. 370.—Grasping the thighs and buttocks during extraction.

backward traction upon the fœtus which is an essential part of the operation. When the knee appears at the vulva, it should be wrapped in a warm sterile towel. A short period of delay may now be granted in order to allow the gradual dilatation of the cervix by the half-breech, provided the fetal heart-sounds are approximately normal, but if there are evidences of impending asphyxia, delivery must be hastened. *This auscultation of the fetal heart should never be neglected.* The foot and leg constitute a convenient handle for traction, which should be made downward and backward in the axis of the pelvic brim. As soon as practicable, however, the grasp should be transferred from the legs to the thighs and buttocks (Fig. 370).

One should avoid seizing the abdomen or testicles, as serious injury has been done in this way. It is highly important at this stage that the operator should guard against posterior rotation of the back, an unfortunate accident which is always due to inefficiency or neglect. Anterior rotation may be effected by gently rotating the hips or by making traction on one leg or the

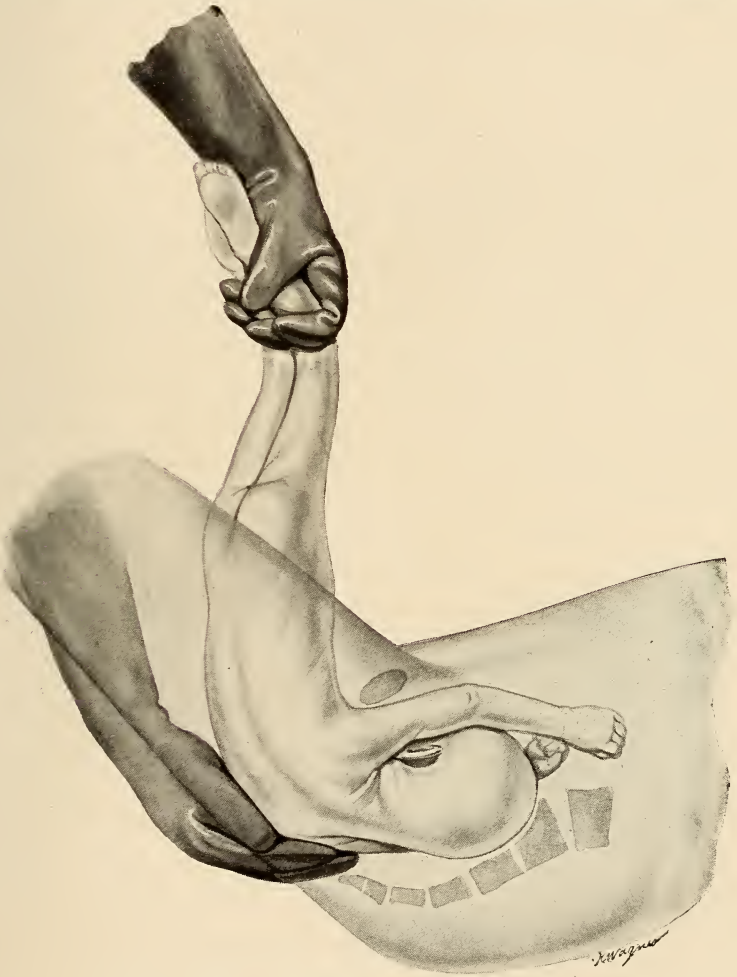

FIG. 371.—Podalic version. Release of the posterior arm.

other, according to the position. Much force is never necessary.

Delivery of the Extended Arms.—With the birth of the breech begins the period of greatest danger to the fœtus, since from now on we can hardly expect to escape the evil consequences of pressure upon the cord. If the latter is put on the stretch, it should be gently drawn down; and if caught between the legs of the fœtus, it should be disengaged. As soon

as the fetal scapula appears at the vulva, the position of the arms should be noted. In uncomplicated breech presentations, the arms may remain folded upon the chest, entering the cavity of the pelvis with the fetal thorax and being easily drawn down by a finger in the vagina; but in many breech cases, and practically always in version, they become extended as the result of traction. Unless the child is premature or very small, the head and extended arms cannot pass the pelvic brim at the same time. The prompt release of the arms, therefore, becomes an important duty of the accoucheur.

As a rule, the posterior arm can be more easily reached, since there is more available space in the hollow of the sacrum. The first step, and this is very important, is to pull the fetal trunk strongly downward in the axis of the brim, *i.e.*, toward the floor. The object of this manœuvre is to make the shoulder more accessible. The feet of the child are then seized and carried strongly upward. In this way the body is made to hug the anterior vaginal wall, giving the greatest possible space posteriorly and bringing the posterior arm well within reach. The operator then follows the fetal back with the disengaged hand, as shown in Fig. 371, until it reaches the posterior shoulder. From this point of vantage he passes the fingers along the arm until he secures sufficient purchase to sweep it downward and forward across the chest. It is well, of course, to reach the elbow joint if one can, but this is not always possible and the time at one's disposal is limited. Sometimes the risk of a fractured humerus must be accepted. The injury heals readily and, as Bumm says, a living child with a broken arm is better than a dead child with the arm uninjured.

For the release of the second arm the trunk is rotated until the arm becomes posterior. It is then released, as already described.

Another method of releasing the anterior arm is to carry the feet directly downward, *i.e.*, toward the floor, and passing the fingers behind the symphysis to the shoulder and arm, as shown in Fig. 372.

In my experience the first of these methods is, except in easy cases, the more prompt and efficient.

Frequently the release of the arms proves a difficult matter. The cause of the difficulty is usually disproportion in size between the head and the pelvis, usually a large head, more rarely, a moderately contracted pelvis. Sometimes the head and extended arms have become jammed together in the pelvic brim, and something may be gained by pushing the fœtus upward. Far more often, however, in my experience, the operator has attempted to release the arms before they were really within reach, and drawing the trunk strongly downward in the axis of the brim and then upward and backward will enable him to succeed. Since I have appreciated this fact I have found the task much easier, and I would strongly urge it upon the attention of the practitioner.

Now and then, for some unexplained reason, it is easier to bring down the anterior arm first. I recently met with a case in which, with two

fingers in the vagina, I easily brought down the anterior arm, although I had failed to reach the posterior. Sometimes, again, one will succeed by passing the fingers along the anterior surface (abdomen and chest) of the fœtus, instead of the back. Now and then an arm will be found behind the neck of the fœtus, preventing the occiput from entering the pelvis. It can usually be brought down by first rotating the fœtus in such a manner

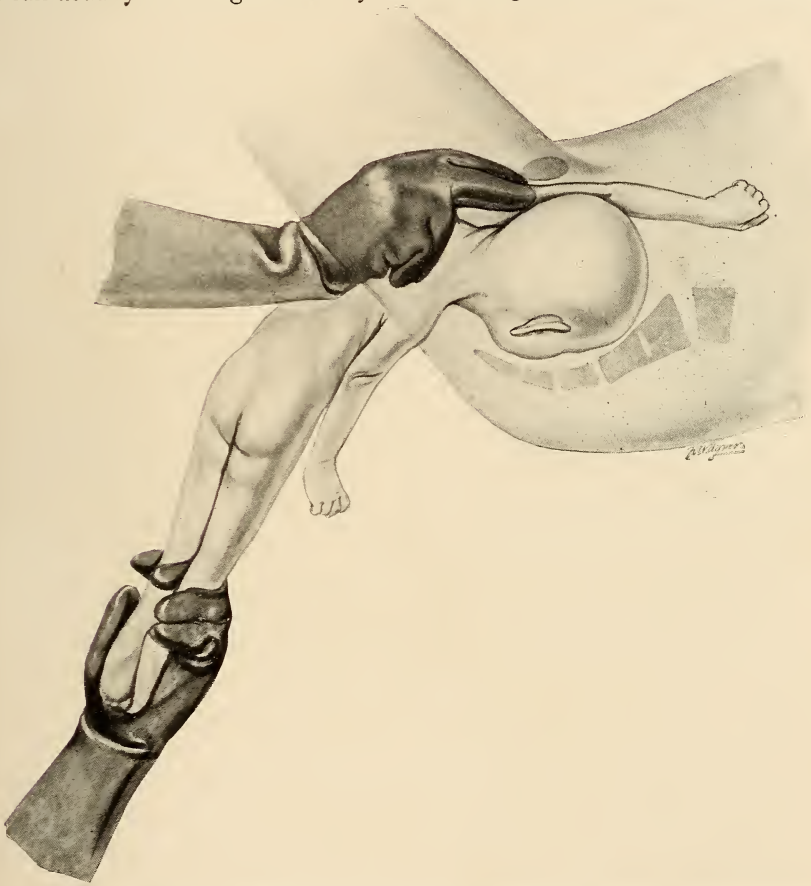

FIG. 372.—Podalic version. Release of anterior arm. It is usually better to rotate the fœtus until the anterior arm becomes posterior and then release it as described.

that the impaction may be released, *e.g.*, if it is the left arm, rotate to the left, and *vice versa*. This carries the arm to the hollow of the sacrum, where it can be most easily reached.

These expedients may be quickly tried one after another, but as a general rule it is unwise to lose such precious time in experimenting with methods of doubtful efficacy. In some cases the only certain way of releasing the arms, if release is possible, is by passing the whole hand into the

vagina. With the hand in the vagina and two fingers in the lower segment, the cause of delay is at once apparent, and set rules of procedure only tend to confuse a situation already clear. It must be admitted that this method subjects the perineum to a severe strain and may result in a bad tear, which should, of course, be carefully repaired, but the mother will forgive her physician for this if he secures for her a living child.

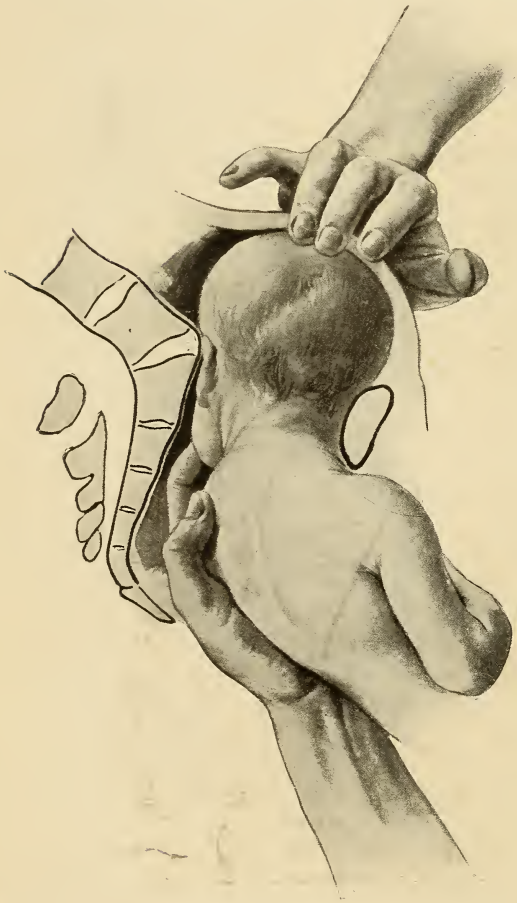

Fig. 373.—Wigand-Martin-Winckel combined method

Delivery of the After-coming Head.—The Combined Method.—The arms having been brought down, it remains to deliver the head. If this is in the cavity of the pelvis, its delivery is usually an easy matter, but if its greatest circumference remains above the brim, much difficulty may be experienced. Many methods of delivering the after-coming head are described in the text-books. Most of them are of historical interest only. To discuss them all would but lead to confusion. I will here consider but three, the method of Mauriceau, which is applicable only to cases in which the head has passed the pelvic brim; the combined method, which includes not only traction upon the fetal body from below, but pressure upon the after-coming head through the abdominal wall; and the method of de Ribes. The combined method is usually regarded as applicable only to cases in which the head is above the brim, but in my opinion it is the quickest and best way out of the difficulty in most cases whatever the position of the head and it will therefore be first described.

The patient remains in the lithotomy position, with the hips well over the edge of the table. As soon as the arms have been delivered, two fingers are passed into the vagina and inserted into the child's mouth, just sufficient pressure being made upon the lower jaw to keep the chin at the breast, and thus maintain flexion of the head. The jaw is not to be used, however, as a traction handle, since serious injuries might be inflicted.

The child rides astride the forearm of the operator, or, better, the feet are held by an assistant, while the operator with his external hand presses the head into and through the brim of the pelvis (Fig. 373).

The beginner is almost sure to make the mistake of pushing the head forward against the symphysis. When the greatest circumference of the head has not passed the brim, pressure should be made directly downward (toward the floor). Often the head slips through with a jerk or crack,

FIG. 374.—Manœuvre of Mauriceau.

which causes the inexperienced operator to fear that he has inflicted some injury upon mother or child. But this is seldom the case. When the head has passed the brim, pressure is made in a more horizontal direction, and as the occiput appears under the pubic arch the fetal trunk is brought upward and backward, while the face, brow and vertex sweep over the perineum. This method of delivery can be used whether the head is above the brim or in the cavity of the pelvis, as I have often demonstrated.

I believe that one who has learned it well will seldom be obliged to resort to the forceps for the delivery of the after-coming head.

In cases of great difficulty the Walcher position may be tried. Since

Fig. 375.—Method of Mauriceau.

the patient is already in the dorsal position, with the hips well over the edge of the table, the assumption of this position involves neither difficulty nor delay.

One often sees an anxious attendant pulling upon the child's feet.

Such traction does no good. Indeed, by favoring extension of arms and head, it is productive of much harm. The practitioner will do well to remember that any nurse or bystander can hold the feet up and out of his

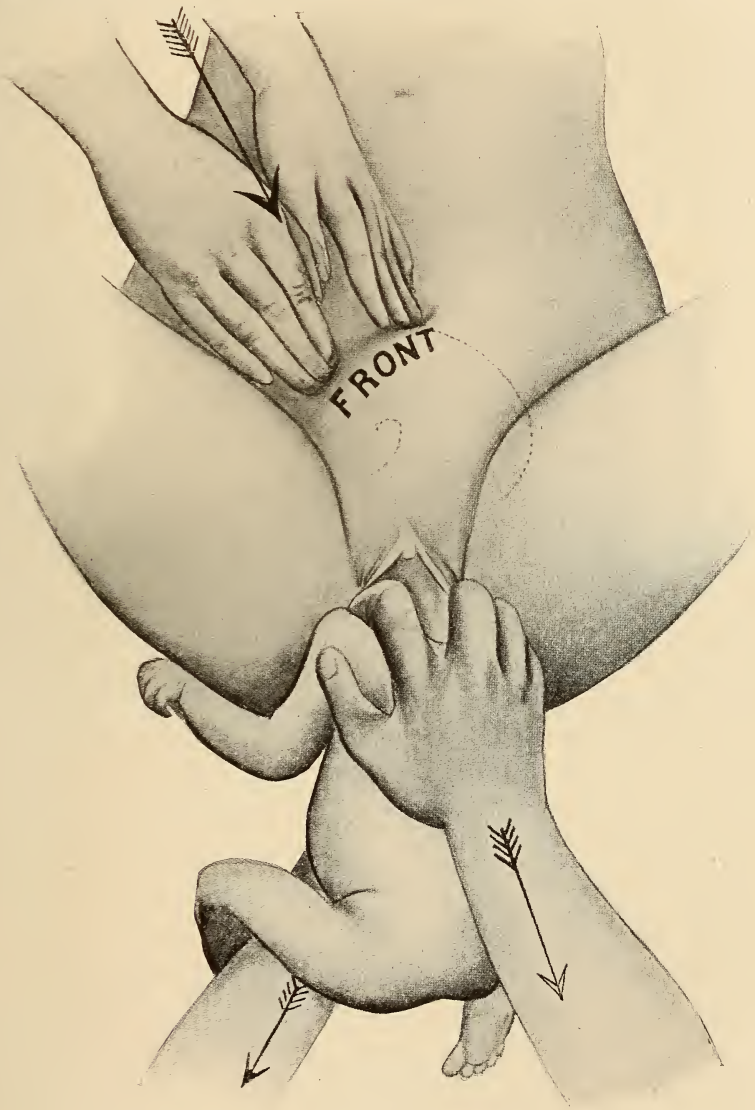

Fig. 376.—Extraction of the head. Manœuvre of Champetier de Ribes.

way. The things that are essential, the flexion of the fetal head by the fingers in the mouth, and the forcing of the head through the pelvic brim by external pressure, only he can perform.

Mauriceau's Method.—In the method of Mauriceau, as in the combined method, the child rides astride the forearm of the operator and the head is flexed by the fingers in the mouth. The right hand, however, instead of making pressure upon the head externally, is used for traction on the fetal shoulders (Fig. 374). This traction is at first downward, but when the occiput appears beneath the symphysis, the body of the child is carried upward and backward, as in the combined method, the face sweeping over the perineum (Fig. 375).

Method of Champetier de Ribes.—In very obstinate cases the manœuvre of de Ribes may be tried. I have, on several occasions, found this very effective. It is a combination of the two methods already

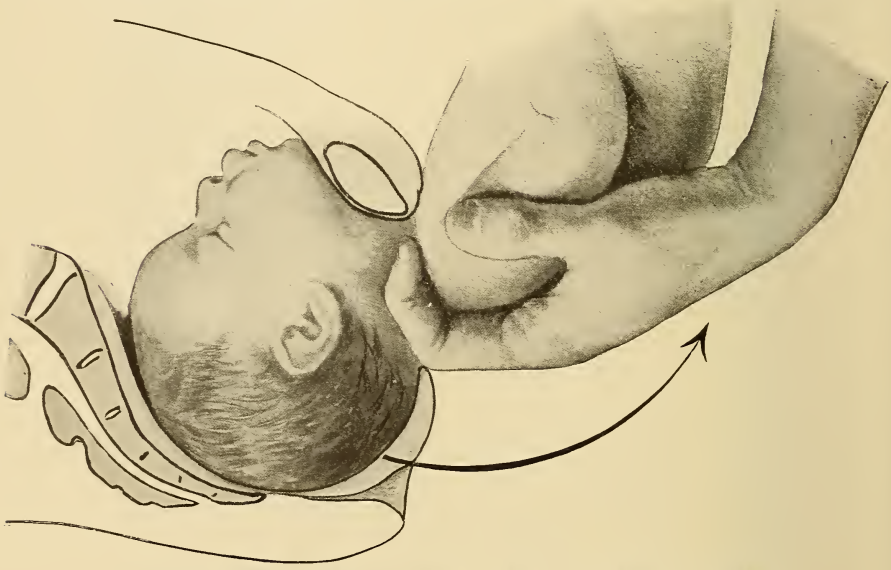

Fig. 377.—Prague manœuvre in posterior position of the after-coming head.

described, and requires the presence of an assistant. The method of its employment is well shown in Fig. 376.

Backward Rotation of the Occiput.—As above noted, the back of the fœtus should always be guided to the front during the extraction of the breech. The careful operator will be on his guard during the delivery of the thighs and trunk, and should have no difficulty in preventing posterior rotation. Should this precaution have been neglected, however, or should such rotation have occurred before his arrival, he should endeavor to rotate the occiput to the front. This is best accomplished by Edgar's method. Two fingers are placed in the child's mouth and the head flexed. With the other hand the shoulders are grasped by the thumb and third and fourth fingers, while the first and second fingers are placed one on each side of the occiput. This gives a very efficient control. If the head cannot be

rotated, it must be extracted with the occiput posterior. The head is usually extended and the chin caught behind the symphysis. Well directed suprapubic pressure will usually force the head into the pelvic cavity, and extraction is completed by carrying the trunk strongly upward and forward over the mother's abdomen. This method exposes the child to much danger, since the neck is drawn forcibly against the symphysis, as shown in Fig. 377, and subjects the perineum to severe pressure. Danger to the child is best avoided by not carrying the body upward until the external hand has forced the head well down into the cavity of the pelvis.

I cannot too strongly emphasize the fact that breech extraction is an operation of difficulty and importance. Once begun, it must be finished within a few moments, or the child will be lost. Here, if anywhere, it is literally true that the physician holds in his hands the keys of life and death. The beginner will do well frequently to rehearse this operation in all its details, to watch its performance when opportunity presents, and to secure, if possible, the advice of an experienced colleague at his first case.

The Cervix as an Obstacle to Delivery.—Contraction of the cervix about the child's neck constitutes a very serious obstacle to delivery. As a rule, the condition does not involve any special danger to the mother, because if she is left alone the cervix will relax after a time and delivery occur spontaneously, but it is, of course, fatal to the child if relief is not afforded within a few moments. Traction upon the shoulders serves only to draw cervix and fœtus to the vulva. If the child is living, multiple small incisions in the cervical margin may suffice to cause rapid dilatation. These incisions should be mere snips with the scissors, not more than one-half centimetre in length. In the meantime, an effort should be made, by means of two fingers passed within the cervix, to relieve the umbilical cord from pressure.

This complication is always evidence of improper technic in the performance of version, of neglect of complete dilatation and paralysis of the cervix. Deep incisions are to be avoided, since they may extend so as to do incalculable harm.

After all versions, the operator should be on his guard against postpartum hemorrhage. Sudden emptying of the uterus always predisposes to hemorrhage, and the profound narcosis necessary in version often causes uterine relaxation that is long-continued and requires constant watchfulness. The careful physician will hardly be willing to leave his patient in less than two hours, and before taking his leave he will be sure to satisfy himself that the uterus is well contracted.

What has been said here refers to internal podalic version in head presentations. Internal version in transverse positions is a subject by itself, and one which merits special consideration. In view of this fact, it is discussed in connection with the treatment of transverse positions, of which, indeed, it forms the principal part.

External Version

In external version, as already stated, all manipulations are made through the abdominal wall.

Indications.—External version is employed for the correction of transverse or breech presentation recognized before the beginning of labor, or, at all events, before rupture of the membranes, and engagement of the presenting part. The period of choice in breech presentation is the end of the eighth month before the engagement of the head and the formation of the lower uterine segment.

Fig. 378.—External version. Photograph of an actual case. The fœtus, of course, is "sketched in."

Contra-indications.—This operation is contra-indicated if the membranes have been ruptured, or if the head has descended into the pelvic cavity, in twin pregnancy, and if the fœtus is dead. In hydramnion it is easy but useless. It is more difficult in primiparæ, but by no means impossible.

Advantages, Disadvantages.—External version has the great advantage of not exposing the mother to the danger of infection. It is said that it may cause the death of the fœtus by pressure upon the cord, or even

separation of the placenta. I have not observed these accidents, and am inclined to think that they are due to its employment in unsuitable cases, or to rough and unskilled manipulations. The chief disadvantage of external version is that it can usually only be performed before labor begins, and that the old position is likely to recur. This, however, is not always the case. Now and then one is gratified to find that in the case of an external version, performed weeks before labor, the normal position is maintained.

Technic.—It is important that the bladder and rectum be empty. The patient should be in the dorsal position, with knees moderately flexed and head and shoulders slightly elevated. In this position the greatest relaxation is secured. The position of the child must, of course, be accurately determined, and the more proficient the operator in the external examination of pregnancy, the more likely he is to succeed.

One hand applied to the head of the fœtus gently urges it in the direction of the pelvic brim, while the other pushes the breech in the opposite direction. It is obvious that the hands should be so applied as to flex both head and breech, thus favoring the natural attitude of the fœtus, and at the same time making it as short as possible. This is well shown in Fig. 378.

The operator should be satisfied with gradual and intermittent progress. When he has succeeded in effecting a partial revolution of the fœtus he should pause for a few moments, meanwhile *holding the fœtus in its newly-acquired position* (Figs. 379 and 380). Manipulations, while persistent, should be gentle and should be suspended if a contraction comes on. Brute force is never justifiable. Pain should not be produced. Experience has taught me that much may be gained by talking to the patient in a reassuring way and by diverting her attention. This helps to prevent nervousness, involuntary resistance and spasmodic contraction of the abdominal muscles. In this way one often succeeds when least expecting it. When the head has been brought to the pelvic brim, it may be maintained in its new position by a pad, or sand-bag, on either side of the uterus, and a bandage. The patient meanwhile remains in bed in the dorsal position. This is manifestly impracticable if the version is done weeks before term. In these cases the patient should be allowed to get up and go about as usual, but should be directed to return in a week in order that the physician may see whether the new position has been maintained (Fig. 381).

Version by the Combined or Bipolar Method of Braxton Hicks

This method, as the name implies, is a combination of external and internal version. The hand is introduced into the vagina, but only two fingers are passed into the uterus. It is not adapted to head presentations at term when immediate delivery is indicated since, as we have already learned, version in such cases should be preceded by complete dilatation

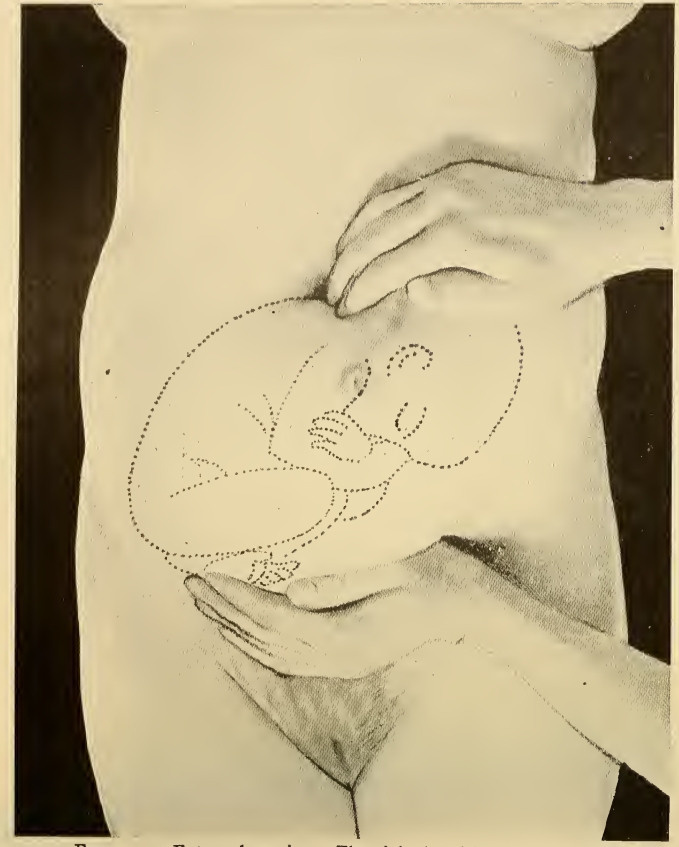

FIG. 379.—External version. The right hand brings down the head while the other lifts the breech.

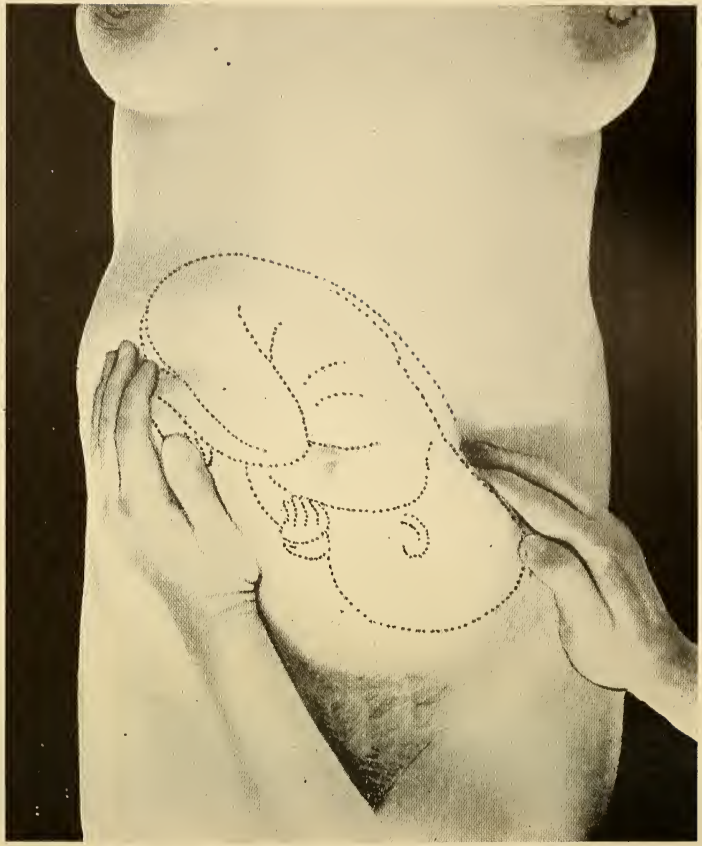

FIG. 380.—External version. The long axis of the fœtus has left the transverse diameter of the uterus and version is accomplished.

As in the internal method, the version is complete when the knee is at the vulva. If the operation has been performed for placenta prævia, or if the fœtus is dead, only moderate traction is made—just enough to gradually " tire out " the cervical sphincter. At the same time the breech acts as a cervical tampon, or if for any reason immediate delivery is regarded as highly dangerous to the mother, only sufficient traction is made to maintain moderate pressure upon the resisting ring. This pressure serves to restrain hemorrhage if present, and is in itself a powerful excitant of uterine contractions.

CEPHALIC VERSION

External version is always cephalic. In transverse positions it would obviously be much more difficult to seize and bring down a head than a foot. Very rarely cephalic version is indicated in the course of combined version. A typical case would be one in which the head is near the inlet, the membranes unruptured, or, at any rate, the fœtus still freely movable, and immediate delivery not urgently indicated.

Pelvic Version

This variety of version is, of course, a matter of necessity, never of choice. For example, if in the attempt to rectify a transverse position of the fœtus the operator finds that he can neither reach a foot nor bring the head to the brim, it is obviously better to bring down the breech, if this be possible, than to leave the transverse position uncorrected.

CHAPTER XXIX

THE CÆSAREAN SECTION

The term "Cæsarean Section" means the extraction of the fœtus through an opening in the abdominal wall and uterus.

Historical.—The operation, as originally performed, dates from high antiquity. There is a classic legend to the effect that Julius Cæsar was "from his mother's womb untimely ripped." Whether this be true or not, the story has survived to give a name to abdominal section for the removal of the fœtus. In Germany the term *Kaiserschnitt* serves well to typify what may well be called the imperial operation—the capital operation of all surgery.

Until 1876 the mortality was over 50 per cent. Before that time it was the custom to leave the uterine incision unclosed. This procedure, which seems incomprehensible to us now, permitted free bleeding and favored the transmission of infection from the uterine cavity to the peritoneum.

In 1876 Porro conceived the idea of eliminating these dangers by removing the uterus. This considerably reduced the mortality. At first, the uterine stump was sewed into the lower angle of the wound and treated extraperitoneally. Later, the development of modern aseptic technic made it possible to suture the stump and drop it back into the abdominal cavity.

The third epoch in the history of this operation dates from 1882, when Sänger showed that by exact suture of the uterine wound the dangers of hemorrhage and infection could be minimized, and the removal of the uterus with its attendant disadvantages made unnecessary.

Davis, of New York, in 1904 introduced the small high incision partly above the umbilicus, in my opinion the most important advance in technic since the time of Sänger. Davis later in the same year made the incision entirely above the umbilicus.

Indications.—An indication for the Cæsarean section may be either relative or absolute. These terms are best defined by illustration.

In certain cases it is impossible to remove the fœtus, except by the Cæsarean section. For example, when the true conjugate is less than 5½ to 6 centimetres it is mechanically impossible to remove *per vaginam* a fœtus of average size. Even a dead fœtus would have to be removed by abdominal section. Its slow dismemberment and removal, occupying hours, would be far more dangerous than the Cæsarean section. Here the indication is absolute. There is no question of doubt or choice.

Another example of absolute indication is to be found in the case of an irremovable tumor blocking the pelvic canal.

But there is a class of cases in which it is difficult to tell in advance whether the Cæsarean section is really necessary. These are the cases in

which some other method of delivery is mechanically possible—cases in which the true conjugate is from 5½ or 6 to 9 centimetres. These are the doubtful cases. The indication is not absolute but relative. The Cæsarean section comes into competition with a long series of operative procedures—symphysiotomy, pubiotomy, craniotomy, forceps and version. Now and then, as every hospital interne knows, the case may be unexpectedly terminated by an easy delivery, no assistance whatever being required.

These have well been called the border-line cases. Their proper treatment constitutes perhaps the most difficult problem in obstetrics. It is considered in connection with the treatment of contracted pelvis. Of course the nearer the lower limit is approached, the more the Cæsarean section comes into consideration, and I believe that it will soon displace both symphysiotomy and pubiotomy, always more or less experimental, though there may now and then be a case in which the latter operation is justifiable.

There has been of late a disposition to extend widely the indications for the Cæsarean section, and to practise it in eclampsia, placenta prævia, prolapse of the cord, and other conditions in which its employment was, until now, never considered. This subject will be taken up in connection with the various complications of labor. Reading between the lines, it is easy to see that many of these operations were performed by surgeons and gynæcologists with little obstetric experience, and might have been avoided. We cannot, however, doubt their occasional justifiability.

Of course, the Cæsarean section should not be performed if the child is dead or non-viable, and especial care should be taken that the fœtus is not premature. For this reason it is better, as will be explained presently, to postpone the operation until labor has begun.

Prognosis.—Before the reforms of Sänger, who was the first to appreciate the great importance of exact suture of the uterine incision, the mortality was fifty per cent. or more, so high indeed that the operation was undertaken only as a last resort, in cases of absolute indication. Since his time, however, the prognosis has steadily improved. In a general way it may now be said that, under favorable circumstances, the mortality is from three to five per cent., though many experienced and careful operators have had long lists of cases with no mortality. Veit, indeed, goes so far as to say that the operation is without danger. This opinion will hardly be shared by the majority of operators.

Previous attempts at delivery, and frequent examinations, especially by those whose asepsis is questionable, render the prognosis much more serious. The existence of infection already present is of course extremely unfavorable, and if under such circumstances an abdominal section appears unavoidable, it is probably better to remove the uterus.

Time for Operation.—Some writers advise that the operation be performed at an appointed time before the beginning of labor. This is, of

course, more convenient for all concerned, but in my opinion it does not conserve the interests of the patient. It is far better to wait until she has had several hours of good labor pains, and this for two reasons.

In the first place, one thus avoids the possibility, or at least the responsibility, of delivering a premature child. I recall a case in which a well-known gynæcologist delivered a non-viable fœtus at an elective operation. Dr. Asa B. Davis relates a case in which an elective Cæsarean section was performed and a premature child delivered, after several experienced consultants had decided that the patient was at term.

Nor is such a case as improbable as at first sight it might seem. It is not always easy to determine the exact period of pregnancy, especially if the patient is a primipara, and the menstrual history doubtful. It is not pleasant to find that one has subjected a mother to an abdominal section for the sake of delivering a dead or non-viable fœtus.

In the second place, by practising the late operation one avoids the danger of hemorrhage from uterine atony, a dangerous complication of which I shall have more to say presently. A uterus that has been contracting strongly and regularly for several hours will continue to contract after the abdomen has been opened.

An additional reason is to be found in the fact that there are many border-line cases in which it is hardly fair to the patient to operate without first giving her the benefit of the test of labor.

Preparations.—It was formerly thought necessary to dilate the cervix before operating in order to secure drainage. Abundant experience has shown this to be unnecessary, even in cases that are operated upon before labor begins. Moreover, it is obvious that this procedure markedly increases the danger of infection.

I have not practised preliminary douching of the vagina, believing that it reduces the normal safeguards against infection and is, to say the least, quite unnecessary. Nor have I had reason to regret its omission.

Twenty minutes before the operation is begun, the patient should receive a hypodermatic injection of some suitable preparation of ergot. There can be no valid objection to this, and it aids materially in reducing the probability of hemorrhage from uterine atony—the only immediate danger that attends the operation.

As a final preliminary the bladder is emptied. This is a precaution tnat should never be omitted. A full bladder not only prevents uterine contraction, but may itself be in the track of the knife.

Ether oxygen should be the anæsthetic. A maximum of oxygen and a minimum of ether. It is wise, whenever possible, to secure the services of a skilled anæsthetist, who will know how to "keep the patient under" with as little of the anæsthetic as possible, thus minimizing postoperative nausea and vomiting, and lessening the danger of fetal asphyxia. Chloroform increases uterine relaxation and predisposes to hemorrhage. Nitrous oxide gas rapidly asphyxiates the fœtus.

Technic.—The importance of the most scrupulous observance of the rules of asepsis cannot be overestimated. Most of the deaths are the result of peritonitis. The iodine method of disinfecting the abdominal surface has simplified the matter of preparation, and is of the greatest possible advantage in emergency cases. The whole abdomen is thoroughly painted with tincture of iodine, two or three coats being applied, without previous washing. If, however, water has been applied to the surface within eight hours, the abdomen should be thoroughly scrubbed with ether and then with alcohol, before the application of the iodine. Gross visible contamination, if present, should first be removed by scrubbing with alcohol.

The operator and his assistants should wear sterile gowns and rubber gloves, and the entire body of the patient, except the field of operation, should be covered with sterile sheets or towels.

It is of the greatest possible importance that the patient be uninfected at the beginning of the operation. Hence, in all doubtful cases, internal examinations should be avoided as far as possible, and as soon as the operation has been definitely decided upon, they should be absolutely forbidden.

But few instruments and appliances are needed. Among these are a scalpel, a pair of blunt-pointed scissors, needles, needleholder, thumb forceps, artery clamps, the usual sterile dressings, and, above all, reliable suture material.

Four assistants are desirable. One to act as first assistant, another to pass instruments and ligatures, a third to receive and attend to the child, and a fourth to give the anæsthetic. A resourceful man will be able to dispense with one or even two of these assistants, especially if a good nurse is in attendance.

Shall the uterus be delivered through the abdominal incision before the removal of the child? This was formerly the universal custom, and is still the general practice of many teachers and operators. I think the question should be answered as follows: The delivery of the uterus makes necessary a somewhat longer incision, and the exposure of so large a viscus probably slightly increases the danger of shock. The operation, however, is somewhat easier, and there is considerably less danger of contamination of the general peritoneal cavity by the uterine contents, for by delivering the uterus from the abdominal cavity, provisionally closing the upper part of the abdominal incision, and carefully surrounding the parts with gauze pads, the escape of the uterine contents may be effectually prevented. This fact has been well emphasized and illustrated by Veit, who reports forty cases treated in this way without mortality, although many of the patients had been long in labor.

The delivery of the uterus through the abdominal incision then is to be preferred.

1. In the case of an operator of small experience called upon to operate in an emergency.

2. In cases in which because of the long duration of labor, or for some other good reason, the operator does not feel overconfident of the asepsis of the uterine contents.

It is quite plain that *no description of the operation is complete unless the technic of both methods is given.*

The incision formerly practised extended from the umbilicus to the symphysis. Strangely enough there are still some who not only practise but even teach this method. Such an incision may injure the bladder, which during pregnancy is, by its attachment to the anterior uterine wall, often drawn far above the symphysis. Moreover, such an incision is much longer than is necessary, and is more likely to result in adhesions between the uterus and abdominal wall than one higher placed. Nor does it give access to the upper part of the uterus, where, as we shall presently see, the uterine incision should be made. The low incision, however, is obviously to be preferred if the Cæsarean is to be followed by hysterectomy. If the uterus is to be delivered, the incision must of course be longer than if it is to be incised *in situ.*

The length and position of the incision then depend altogether upon the character of the proposed operation.

Let us assume that the uterus is to be delivered. An incision from 12 to 16 centimetres is made at the left of the umbilicus, and with the latter as its middle point. The length of the incision will depend upon the size of the uterus and its contained fœtus, and it is better to make the shorter incision at first, lengthening it later if necessary. The abdominal wall is very thin in advanced pregnancy and the incision should be cautiously made, the operator recalling the possibility of bladder or loops of intestine in front of the uterus, or, if a previous laparotomy has been done, of adhesions. Spectacular haste is out of place here. More than once I have seen an incautious operator cut into the uterus at the first stroke. It is wise to "buttonhole" the abdominal wall and prolong the incision with the scissors, using the finger as a guide.

The thinned and atrophied tissues bleed but little and no clamps may be required. The blue-gray surface of the uterus shining through the filmy transparency of the peritoneum makes, upon the man doing his first Cæsarean section, an impression never to be forgotten. The abdominal wall stretches easily in advanced pregnancy, and a finger hooked into each end of the cut converts an incision which at first seemed too short into one of sufficient length.

One hand brings the fundus through the incision. This is very materially aided by having an assistant make pressure alternately upon the sides of the uterus through the abdominal wall. The upper part of the incision is then provisionally closed by two or three sutures of silkworm gut and sterile gauze is packed about the uterus, both these measures being designed to keep the uterine contents out of the peritoneal cavity. The Trendelenburg position aids materially in this respect.

It is true that bacteria can be demonstrated upon the surface of the uterus. Their presence is the result of the overflow of the uterine contents. But, as Veit pertinently remarks, if they find no medium in the peritoneal cavity on which to grow, they are harmless.

The incision in the uterus must be large enough to admit the hand. Here again it is better to make a buttonhole incision and prolong it with the scissors, thus avoiding the danger of injuring the fœtus. It should be a high one, beginning at the fundus and extending directly downward only as far as is necessary and it should be exactly in the median line (Fig. 383).

By limiting the incision to the upper part of the uterus one avoids the lower non-contractile, vascular portion, as well as the region of the bladder, and by keeping it in the median line one avoids the larger branches

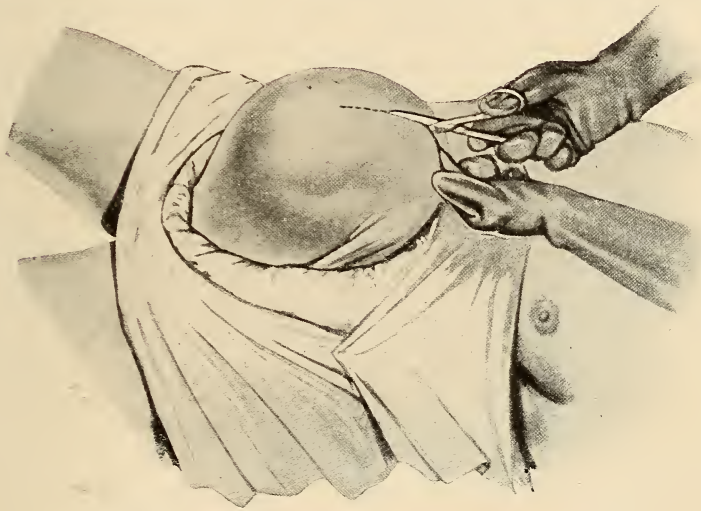

FIG. 383.—Cæsarean operation. High incision in median line.

of the uterine arteries. The operator should recall the usual right obliquity of the uterus and not make the incision too far to the left.

If the placenta lies immediately beneath the incision, as it often does, no time should be lost in attempting to separate it, but the hand should be passed directly through it, as in central placenta prævia. The child should be seized by the foot and extracted, as in Mauriceau's method, head flexed, and back toward the mother's feet. It is better to extend the incision a little, if necessary, than to risk tearing the uterus. An assistant now cuts the cord between two clamps and takes charge of the child. Do not worry if the child does not cry at once. A slight delay in the establishment of respiration is a physiological peculiarity of the Cæsarean section, and is due to the suddenness of the change from intra-uterine to extra-uterine conditions (Fig. 384).

The placenta and membranes are now removed. Special care should

be taken that the removal of the membranes is complete, especially in the lower uterine segment, where they are often adherent at this time. In these cases it is made much easier by wrapping the finger in gauze.

During the opening of the uterus and the removal of the fœtus hemorrhage may be profuse, but the operator should not allow this to disconcert him. At this time sutures and sponges are as useless as they would be in a case of placenta prævia. As in the latter condition, the bleeding will not cease until the uterus contracts and the uterus cannot contract until it is empty. The best way to stop the hemorrhage is to empty the uterus without delay.

When the fœtus and placenta have been removed, the uterus contracts, and the bleeding from the placental site ceases, though there may still be considerable oozing from the cut surfaces in the uterus. This ceases as

Fig. 384.—Cæsarean operation. Extraction of the child, fundus brought through incision.

the incision is sutured. Proceed then as rapidly as is consistent with careful work. It was formerly thought necessary to constrict the cervix with a rubber band, or to have it compressed by the hands of an assistant, but this has been shown to be quite unnecessary. Moreover, it shuts off the blood supply of the fœtus, and predisposes to atony of the uterus. Massage of the uterus and the pouring of hot saline solution into its cavity almost always suffice to bring about contraction. Cragin has noted that in cases of obstinate relaxation the uterus contracts better if it is returned to its usual position and the suturing completed within the abdominal cavity. Obstinate and uncontrollable relaxation demands the removal of the uterus. This complication, however, is extremely rare and in my experience can always be prevented by operating at the proper time, *i.e.,* during the first stage of labor, and by giving a hypodermatic injection of ergot twenty minutes before the operation.

Now comes the suture of the uterine wound—the most important part

of the operation. The sutures may be either interrupted or continuous. Many writers advise the former, but after trying both methods I am convinced that a continuous suture in three layers affords a much more secure closure of the wound and is attended by less bleeding. Perhaps the interrupted suture is a little easier, but I have not found this to be the case. I use two layers of chromic gut, medium size, in the uterine wall, and one superficial layer of fine chromic gut to unite the uterine peritoneum (Fig. 385). The first layer unites the deeper part of the incision in the uterine wall. The operator should be careful not to enter the cavity of the uterus,

FIG. 385. FIG. 386.

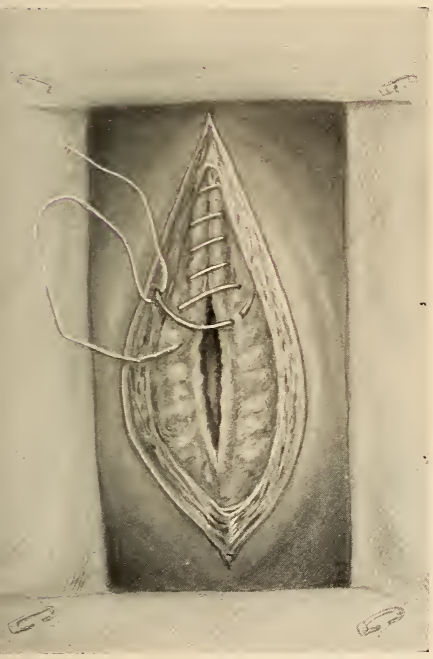

FIG. 385.—Cæsarean operation. First layer of sutures.
FIG. 386.—Cæsarean operation. Second layer of sutures.

nor to include the decidua, since infection might thus be transmitted and rapid union prevented. The second layer unites the outer half of the uterine wall, while the third suture of fine gut includes the peritoneum only (Fig. 386). Some operators unite the peritoneum by a Lembert suture, but this takes time and has been shown to be unnecessary. The accompanying illustrations show the best method of closing the uterine wound.

Fig. 387 shows how the assistant should hold the uterus while the sutures are being placed. This method freely exposes the tissues to be sutured and enables the operator to work to better advantage. It also helps to prevent hemorrhage.

The peritoneum and fascia are closed by continuous suture with chromic gut (Fig. 388). The skin edges are then united by sutures of silkworm gut.

Following Fritsch various operators have made the uterine incision across the fundus instead of in the anterior wall. Recently Veit has adopted this method in a long series of cases with good results. It is only adapted to cases in which the uterus is delivered through the abdominal incision, and, as Veit himself admits, is probably no more effectual in preventing contamination of the peritoneal cavity than is the high anterior incision. It has been claimed by the advocates of the fundal incision that it is less likely to result in adhesions between the uterus and abdominal

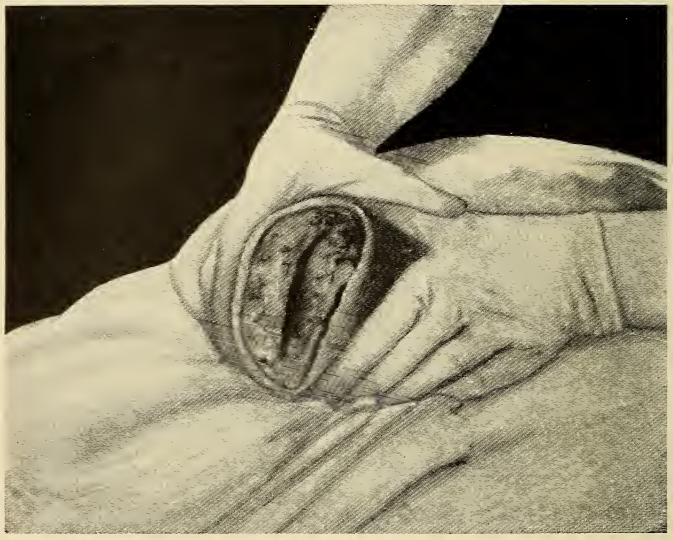

FIG. 387.—Cæsarean operation. Uterus held by assistant for placing of sutures.

wall, but it would seem, as Williams remarks, that this is more than counterbalanced by the danger of intestinal adhesions in the fundal incision, and by the transmission of infection should it occur to the peritoneal cavity.

Let us now consider a case in which the uterus is not to be delivered until after the extraction of the fœtus. Here the incision is shorter, 8 to 10 centimetres in length. It is more convenient to make the incision to the right of the umbilicus, since it is more apt to coincide with the middle line of the uterus and in this way the assistant is not obliged to rotate the uterus. Experience shows that the gauze pads formerly used can be dispensed with. Contamination of the peritoneal cavity is best prevented by having the assistant keep the abdominal walls in close contact with the uterus while the incision is being made and while the uterus is being delivered after the removal of the fœtus.

This operation is best restricted to uninfected cases in the hands of operators of some experience; but with these limitations it gives excellent results. Operative shock is minimized, hernia prevented, and the resulting scar is insignificant.

With the removal of the fœtus and placenta, the uterus, now greatly reduced in size, is brought out through the abdominal incision where it can be carefully walled off, and conveniently and exactly sutured in the manner already described.

Davis, in 1904, practised for the first time the small, high, median incision above the umbilicus. The advantages claimed for it are the following: "The abdominal wall at this point, in the full term woman, is thin and stretches easily. The small, high incision does not allow easy exposure or escape of the abdominal contents. Not infrequently, all that we see is the uterus and a small portion of omentum. This wound is away from the site of greatest strain upon the abdominal wall, at a point reinforced by the recti muscles as they approach each other toward their upper attachments. It is small. We have never seen hernia following it. The liability to adhesion between the abdominal wound and the uterine wound is greatly diminished."

FIG. 388.—Cæsarean operation. Suturing the skin-edges with silkworm gut.

After-treatment.—The after-treatment does not differ materially from that of laparotomy in general. Recalling the importance of prompt and secure union of the uterine incision, the patient should be kept quiet for at least two weeks. Severe pain and, in particular, vomiting and retching, so common after operations, are highly undesirable at this time and should be promptly suppressed by the hypodermatic administration of pantopon or morphine. A tight bandage is out of place. It probably promotes the formation of adhesions between the uterus and abdominal wall. According to DeLee it may also cause ileus and dilatation of the stomach. Other things being equal, the patient should not only be allowed, but encouraged, to nurse her child. This promotes uterine contraction and aids involution.

Technically the Cæsarean section is not a very difficult operation. The chief difficulty is to determine whether it is indicated in a given case. This is often a difficult problem, though with the steady improvement in the

technic and results of the operation the decision does not involve as serious a responsibility as formerly.

I would sum up the salient points as follows:

The operation should be performed as near the time of labor as possible, preferably not until after the beginning of labor.

The strictest asepsis should be observed and all vaginal examinations or manipulations not absolutely necessary for diagnosis should be prohibited.

A full dose of ergot should be given hypodermatically twenty minutes before the expected operation.

The length and location of the abdominal incision depend altogether upon the circumstances of the individual case.

The uterine incision should be carefully and exactly sutured, the continuous suture being preferable.

Whenever the patient has been long in labor the uterus should be delivered through the abdominal incision and carefully walled off from the peritoneal cavity before the uterine incision is made.

The Porro Operation

When the removal of the fœtus is followed by the removal of the uterus, the procedure is commonly known as the Porro operation. Of this we have already spoken.

The original operation of Porro, in which the stump was sewed into the lower part of the wound, has been practically superseded by the modern method of supravaginal hysterectomy, *i.e.,* amputation of the uterus above the cervix, with closure of the abdominal wound.

This operation, the study of which is very generally neglected, should be familiar to every one who does much obstetric work, since an emergency requiring its performance may arise at any time, *e.g.,* in the case of rupture of the uterus, or of uncontrollable hemorrhage during the Cæsarean section. Such emergencies, it is true, are not common, but do occasionally occur.

Then, too, the operation is not so difficult that anyone of fair surgical training need shrink from its performance, since owing to the serous infiltration of the pelvic structures the uterus can be lifted up until the structures to be sutured and ligated are in plain view.

Indications.—The Porro operation is indicated when there is a probability that the uterine contents are infected, in certain cases of uterine atony, in certain cases of tumor formation, *e.g.,* in carcinoma, or in extensive fibroid degeneration, and in certain cases of rupture of the uterus. Finally, it has been used as a means of sterilization in cases in which it was deemed unwise for the patient to undergo the risk of subsequent pregnancies.

Technic.—Since there is, of course, no danger of hemorrhage from uterine atony in this operation there is more justification for choosing a convenient time before labor begins than in the case of the Cæsarean section. But the operator should satisfy himself that he is not dealing with a

premature child, and if there is the slightest doubt about this, the operation should be delayed. Very often, however, it is an emergency measure and must be done at once.

The student is usually told that until the fœtus has been removed from the uterus the technic of the operation is the same as in the case of the conservative Cæsarean section. A moment's reflection will show that this is not the case, if the removal of the uterus has been decided upon in advance. In the latter case the incision is the same as that of any ordinary hysterectomy, *i.e.*, chiefly, or altogether, below the umbilicus, and the higher incision suitable for the Cæsarean section would obviously be out of place.

After the fœtus and placenta have been removed, the operator should waste no time in searching for the membranes, but should proceed at once to the removal of the uterus, leaving the ovaries, tubes and round ligaments, unless there is some good reason for their removal. As infection is often suspected in these cases the abdominal cavity *should be walled off with great care*. For the same reason the incision is best made at the fundus, and with the patient in the Trendelenburg position.

The ovarian arteries and the arteries of the round ligaments are ligated or clamped at some distance from the uterus, and a clamp is applied close to the uterus to prevent the anastomotic reflux of blood. The same process is repeated upon the other side, the broad ligaments are severed with the scissors, and an anterior peritoneal flap marked out just above the bladder, by the finger or by blunt dissection.

We now come to the most important part of the operation, the ligature of the uterine arteries. The pulsations of the artery can usually be felt, although it may not be possible to isolate it completely, owing to the enormous varicosities of the broad ligaments that are so constant an accompaniment of pregnancy. The artery should be ligated with great care, the uterus meanwhile being drawn to the opposite side, and the artery tied as near to the uterus as possible, leaving, however, space enough to prevent slipping, both these precautions in order to avoid the ureters. The uterus is now cut away, clamps and all, the anterior and posterior flaps united in such a way that no raw surfaces are left exposed, the cut surfaces in the broad ligaments united by a continuous suture and the abdomen closed in the usual manner.

In total hysterectomy the cervix and upper part of the vagina are removed, and the upper end of the remaining portion of the vagina sutured with catgut. This operation has been advocated in cancer of the cervix complicating pregnancy, and in certain cases of infection. It is much more difficult, requires more time, and considerably increases the danger of shock. Its efficiency in cancer is a gynæcological question which need not be considered here. In cases of infection its advantages over the supravaginal operation are doubtful. It is certainly no operation for the general practitioner, and the specialist needs no instruction in its technic.

The Original Porro Operation (Fig. 389)

Here again the patient should be in the Trendelenburg position, and if the nature of the operation is already decided upon, the abdominal incision should be below the umbilicus.

This operation, which has been generally abandoned because of the prolonged convalescence and the unsightly scar which follows, is nevertheless occasionally justifiable *as a measure of necessity,* for example, in the case of a man inexperienced in abdominal surgery, and without the necessary assistance or surgical outfit for hysterectomy, as usually performed. Jeannin believes that owing to its simplicity, and the ease and readiness with which it can be performed, it is our best resource in those

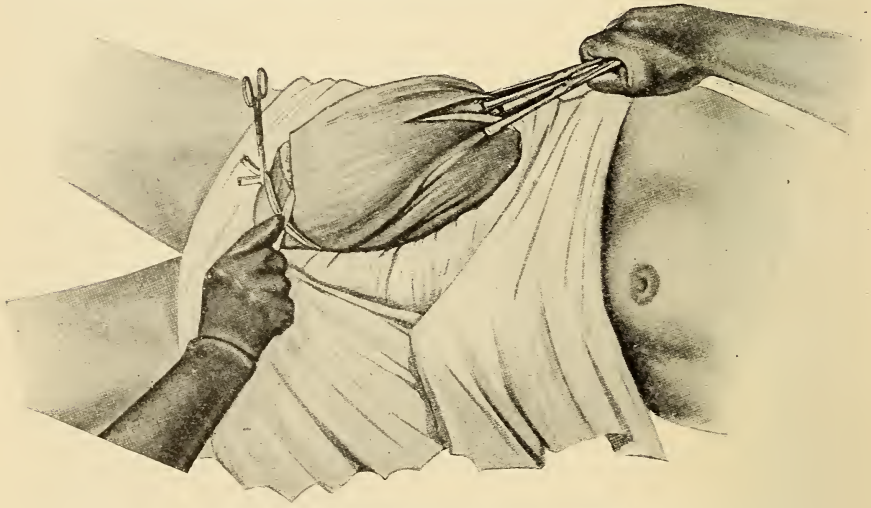

Fig. 389.—Porro operation. Uterus amputated above elastic ligature, which is placed on the lower segment.

cases of severe and uncontrollable hemorrhage that sometimes occur in the course of the Cæsarean section.

Technic.—As in the case of supravaginal hysterectomy, the patient should be in the Trendelenburg position, and the uterine incision should be at the fundus in order to prevent, as far as possible, the escape of the uterine contents into the abdominal cavity. As soon as the fœtus and placenta have been delivered, strong traction should be made upon the uterus by an assistant, and the operator should convince himself that the bladder is not drawn up also. Should this be the case, the bladder should be pushed down and out of the way by the finger wrapped in gauze. The rubber constrictor should then be applied as far down as possible and the uterus with tubes and ovaries is amputated an inch above the constrictor. A sterilized knitting needle or some similar instrument passed through the stump and resting on the surface of the abdomen prevents

it from falling back. The abdominal incision is then closed, except where the stump protrudes, and here the peritoneum is carefully sewed to the peritoneum of the stump, below the rubber constrictor.

The stump should then be cauterized, dusted with an antiseptic powder, and covered with sterile gauze.

Separation of the stump occurs in about two weeks, but three weeks more may be required before cicatrization is complete.

Sterilization of the Patient.—Some writers have advocated the sterilization of the patient with the view of preventing the necessity for subsequent Cæsarean sections. There was undoubtedly more justification for this procedure in former years when the mortality of the operation was almost prohibitive. At present it hardly seems to be called for, except in cases of osteomalacia.

If sterilization is decided upon, the best procedure is supravaginal hysterectomy, already described. Other methods are uncertain or dangerous. Ligation of the tubes has been shown to be ineffectual, and removal of the ovaries is dangerous at this time, since the descending uterus, by dragging upon the pedicles, may cause slipping of the ligatures. The fundal incision, extended so as to permit the excision of the proximal ends of the tubes, is effective, but in this case the incision is a long one and, should any infection be present, the danger of its transmission to the peritoneal cavity would be considerable.

Repeated Cæsarean Sections in the Same Patient

One Cæsarean section is no bar to another. Women who have had two operations of this kind are not infrequently seen in the maternity hospitals of New York. One of my own patients had three, and other observers have reported cases in which the number was four or even five. There is undoubtedly a slight risk of uterine rupture in subsequent labors. The danger is slight, however. Broadhead, in his review, found but twenty cases in the entire literature of the subject. Probably in most of these cases the old incision in the lower uterine segment had been employed. Of course a patient who has been subjected to the operation should not be allowed to linger long in labor.

Extraperitoneal (Suprasymphyseal) Cæsarean Section (Figs. 390 and 391)

Seeking to obviate the dangers of the classical Cæsarean section in cases of possible infection, and also to do away with intestinal and epiploic adhesions, Frank has recently devised a method of gaining access to the fœtus through the lower uterine segment, after stripping the latter of its peritoneum.

Technic.—A transverse incision is made about two fingers' breadth above the symphysis, the recti are separated, and the bladder and anterior surface of the lower uterine segment brought into view. With the finger,

wrapped in gauze, the bladder is pushed to one side and the peritoneal reduplication of the lower uterine segment pushed well upward. In the anterior wall of the segment thus exposed, a longitudinal incision is made. The segment is distended by the presenting part and its walls are very thin, so that caution is necessary to avoid injuring the child while making

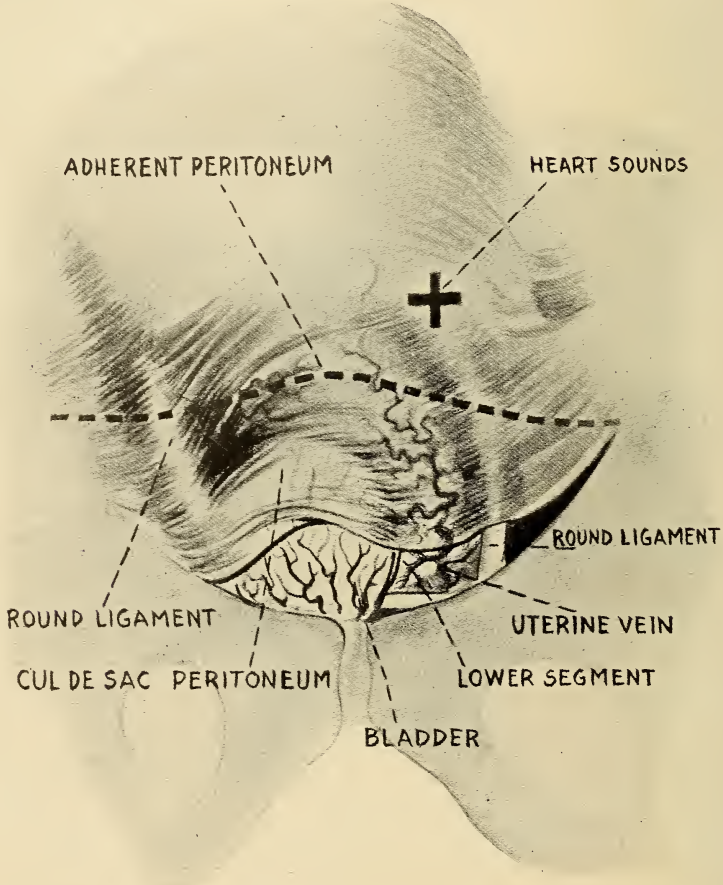

FIG. 390.—Extraperitoneal Cæsarean section, showing anatomical relations of peritoneal *cul de sac*, bladder and left side of uterus.

the incision. The fœtus is then delivered, either by simple pressure or by forceps or version, according to indications.

After the delivery of the placenta and membranes, the uterine wound is closed with a running catgut suture, and the abdominal wound closed in three layers, recti, fascia and skin.

The exposure and incision of the lower uterine segment do not present

great technical difficulties, but the incision is not infrequently too small for delivery without laceration. As a matter of fact, the peritoneum has been torn in many cases. Infection of the cellular tissue, sometimes of severe type, has also been noted.

Döderlein has recently practised a modification of this operation, in

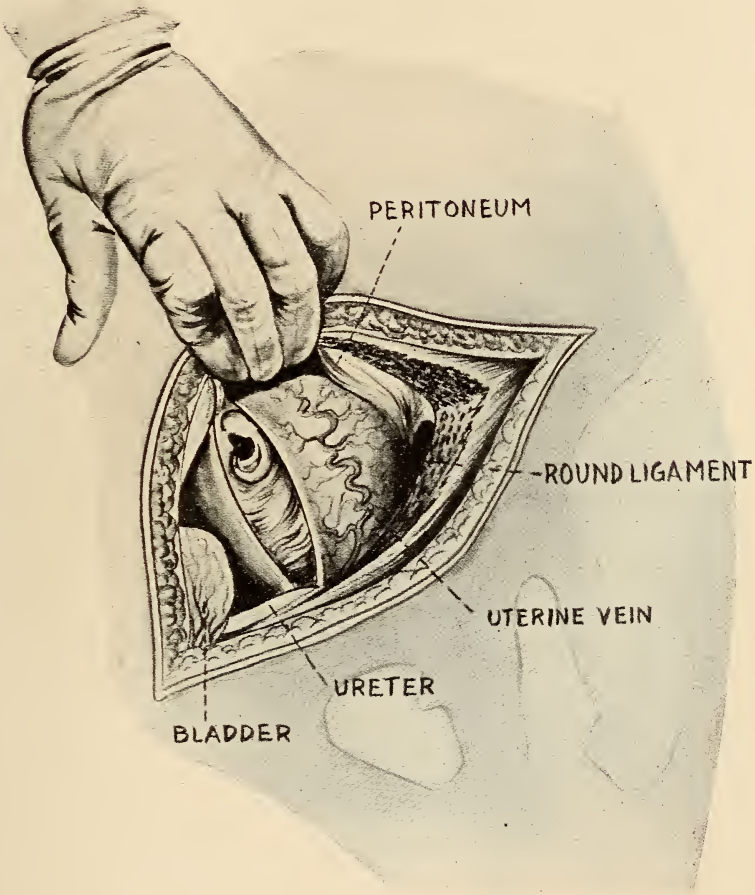

FIG. 391.—Extraperitoneal Cæsarean section. Incision of lower segment after pushing back the peritoneal *cul de sac*.

which the incision instead of being median, *i.e.*, above the symphysis, is lateral and parallel to Poupart's ligament, the lower uterine segment being entered from the side. This is practically a revival of the laparo-elytrotomy of Gaillard Thomas, tested and abandoned here in the early seventies. These operations were devised and advocated with the idea that they would prove safer, in cases possibly infected, than the classical

Cæsarean section. It has been shown, however, that even if there is no injury to the peritoneum, severe infection of the cellular tissue may occur. Moreover, they are technically much more difficult than the Cæsarean section. The peritoneum has been torn many times and even if there is no injury to the peritoneum, severe infection of the cellular tissue may occur. In one of Döderlein's cases hemorrhage was so severe that he was compelled to desist and resort to the conservative operation. Thus far these operations have gained no favor in America.

Post-mortem Cæsarean Section

If a woman dies during pregnancy and there is reason to believe that the fœtus is viable, an immediate Cæsarean section should be performed. It is quite true that a living child will seldom be secured, but the physician will have done his duty in the matter and he may be quite sure that the mother, if able to, would commend his course. The whole procedure need occupy but a moment, as no preparation is necessary. The incision should be promptly and carefully repaired. No time should be lost. It is folly to waste time listening for the fetal heart. Performed in this manner, the Cæsarean section is less revolting than the *accouchement forcé* and gives a much better chance of securing a living child, since if the pelvis is small or the head large the child is inevitably lost. The consent of those nearest the patient should, of course, first be obtained, if possible, though the law does not require this.

Puech, quoted by Garrigues, found that in 331 operations 101 children showed signs of life when born, but only 43 survived. Cases have been reported in which the child lived twenty minutes, or even more, after the death of the mother. Most of these cases are apocryphal. When the mother dies suddenly, as from the result of an accident, the fœtus is more likely to survive her death for a few moments than if she dies as the result of some exhausting disease.

CHAPTER XXX

SYMPHYSIOTOMY AND PUBIOTOMY

The idea of securing the delivery of a living child by dividing the bony girdle of the pelvis has long occupied the minds of those interested in obstetrics. It has been carried into effect in two ways: by dividing the pubic joint (symphysiotomy), and by dividing the pubic bone at one side of the joint (pubiotomy). Let us first consider the older operation.

Symphysiotomy

Historical Note.—The operation was first performed by Sigault, of Paris, in 1777, but soon fell into disuse. Morisani, of Naples, revived the operation in 1866, and since then it has been generally practised in Italy, although of late it has been in large measure displaced by the newer operation of pubiotomy. In 1892, Pinard's advocacy of symphysiotomy rendered it popular in Paris, and it was first performed in this country by Garrigues on December 30th of the same year.

Technic.—Careful asepsis, including shaving of the *mons veneris* and lower abdomen. As these cases are practically all emergency cases, it is perhaps better simply to cut the hair close about the pubes and paint the

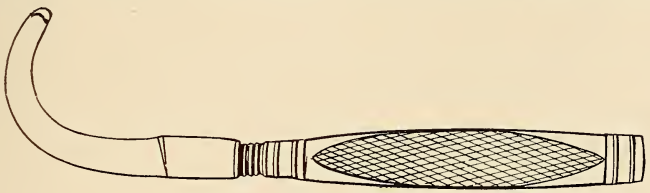

Fig. 392.—Galbiati's falcetta.

parts with tincture of iodine. The patient should be placed in the dorsal position, with the bladder and rectum empty, and the thighs flexed and rotated outwards, in order to open and make more accessible the pubic joint.

But few instruments are required: a scalpel, a thumb-forceps, a few clamps, a needleholder and needles, as for any minor cutting operation; also, and these are indispensable, a metallic catheter or sound for holding the urethra to one side, and a stout blunt-pointed bistoury, or the sickle-shaped knife of Galbiati, for dividing the symphysis. The obstetric forceps should be at hand, as well as everything necessary for resuscitating the child (Fig. 392).

Two medical assistants are desirable, one to give the anæsthetic and another to assist directly at the wound, and to resuscitate the child if necessary. Two more assistants whose duty it is to make pressure in the

region of the trochanters and prevent undue separation at the symphysis are absolutely necessary. The latter need not necessarily be physicians, but should be carefully instructed in advance, as the duties which they have to perform, and which will presently be described, are important.

An incision, 5 or 6 centimetres in length, is made, exactly in the median line, and extending from a finger's breadth above the symphysis to just

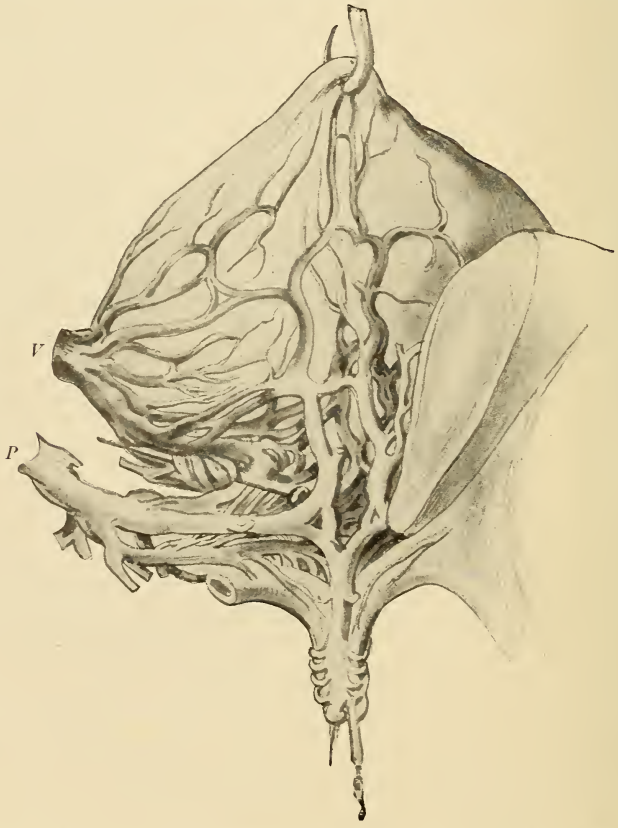

FIG. 393.—Veins of the prevesical space. Front view of the bladder and dorsal surface of the clitoris, the right crus of which, as well as the right side of the pelvis, has been cut away. *P*, internal pudic vein, receiving blood from the dorsal and cavernous veins of the clitoris, the urethral and anterior vesical veins, as well as from below from the bulb, the perineum, and the anus, which have been cut short; *V*, large vesical trunk, receiving blood from the vesical plexus, which anastomoses with the tributaries of the internal pudic vein. A pin has been placed between the two chief veins.

above the clitoris. This incision divides the insertion of the recti muscles, but avoids the transversalis fascia beneath. The finger, passed down the front of the symphysis, feels the sharp edge of the *ligamentum arcuatum*, the suspensory ligament of the clitoris is divided by a transverse incision, and the clitoris itself drawn down and out of the way. The finger is then passed behind the symphysis into the prevesical space, and the tissues

carefully separated from the posterior surface of the symphysis, and for a distance of 2 or 3 centimetres on each side, in order to prevent injury to the bladder during the division of the joint. A sound is now passed into the bladder, and an assistant holds it well to one side, thus protecting the urethra and bladder from injury, while the operator divides the symphysis and the subpubic ligament, from above downward and from before backward.

After the division of the symphysis the bones separate of themselves, but a too sudden, or great, separation should be prevented by the assistants. The amount which may occur without apparent harm is sometimes remarkable, but a separation of more than 6 or 7 centimetres should not be permitted, as it endangers the integrity of the sacro-iliac joints.

Hemorrhage.—Considerable bleeding may occur at this time from the veins of the prevesical space. The accompanying illustration from Garrigues well shows the abundant venous supply of this region. This hemorrhage may usually be checked by firm and continued pressure. As a rule suturing does more harm than good. The needle pricks bleed freely and it is impossible to suture the whole mass (Fig. 393).

Delivery After the Division of the Symphysis.—The symphysiotomy proper is now complete. If this were all, patient and physician would indeed be fortunate, but the child is still to be delivered, and this delivery, especially if the child be large, or if we have overestimated the size of the pelvis, is by far the most formidable part of the operation. The soft parts behind the symphysis have lost their natural support, and may be extensively torn during extraction. These tears may involve the bladder or urethra, or large veins in the lower part of the prevesical space may be involved, severe hemorrhage resulting.

After the division of the symphysis and during the delivery which is to follow, the assistants, one on each side, keep up pressure in the region of the trochanters, and must be constantly on their guard against too great a separation (Fig. 394).

In Italy, where the operation has been long and extensively practised, it is customary to leave the patient for two hours or so in labor; immediate operative delivery being practised only when specially indicated, or when the head has descended to the floor of the pelvis. This is also the custom of Zweifel, a very successful operator in this field. In my opinion, it is the best method. I am convinced that many of the bad results in symphysiotomy have been due to hasty and unskilful deliveries, especially versions. If operative delivery becomes necessary, the forceps should be preferred as far safer for the child; and this applies to pubiotomy as well. It is irrational to subject the mother to an operation like symphysiotomy or pubiotomy for the express purpose of saving the life of the child, and then to select, as a method of delivery, that which is most dangerous to the child. I have seen some very difficult versions after symphysiotomy.

It is highly important that a good forceps operator be in attendance.

The axis-traction forceps are preferable, as imposing less strain upon the soft tissues behind the symphysis and making less pressure upon the fetal head. During the final extraction of the head it should be held well back, against the sacrum, and when the head is brought over the perineum the handles should not be raised as much as usual, since it is justifiable under these circumstances to incur a somewhat greater risk of perineal laceration than at other times.

After the delivery has been completed, the thighs are extended and rotated inward in order to close the joint, care being taken that the bladder, or other soft structure, is not caught between the ends of the bones.

The tissues in front of the symphysis are united by sutures of silkworm

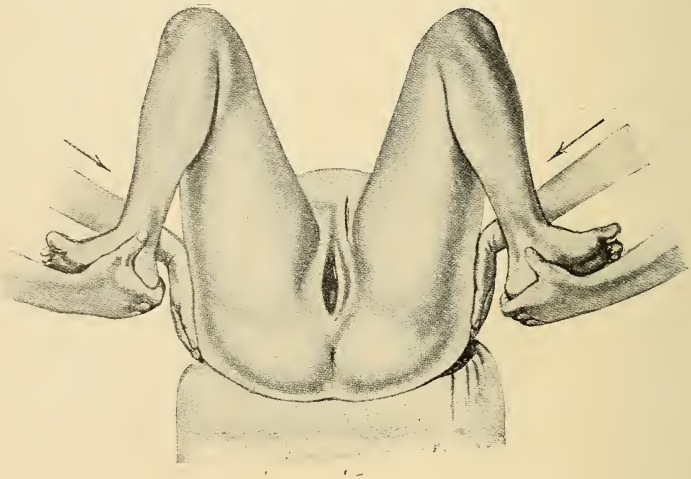

FIG. 394.—Separation, with injury to soft parts, prevented by pressure over trochanters.

gut. Experience has shown that it is not necessary to suture the bone or cartilage, and such sutures may suppurate. A gauze drain is left in the upper end of the wound, and there should be separate dressings for the vulva and vagina. This to avoid, if possible, the contamination of the wound by the lochial secretion.

After-treatment.—No complicated apparatus is necessary. Broad strips of rubber adhesive plaster, drawn tightly about the pelvis, suffice to keep the ends of the symphysis in apposition, and have the advantage of being waterproof (Garrigues). The Bradford frame or the hammock bed of Ayers are convenient and conduce to the comfort of the patient. A retention catheter is advisable for the first week or two, in order to avoid the joint movement attendant upon too frequent catheterization. The patient should remain in bed for three weeks.

Other Methods.—Morisani divides the symphysis from behind forward, and from below upward, by means of the falcetta or sickle-shaped knife of Galbiati. Zweifel uses a Gigli saw, and saws through the sym-

physis as one divides the pubic bone in pubiotomy. Harris modified the operation by limiting the incision to the joint proper and not dividing the subpubic ligament. He separates the latter, however, for a distance of 2 or 3 centimetres on either side, seeking thus to avoid tears of the venous plexus.

In the subcutaneous method of Ayers, the clitoris is drawn down and an incision made just above it. A blunt-pointed bistoury is then introduced into the opening and carried to the upper border of the symphysis, where it is met by the index finger in the vagina. Finger and bistoury are then brought down together until they approach the subpubic ligament, when, in order to avoid hemorrhage, the bistoury is removed and reëntered with its cutting edge upward.

Pubiotomy

Gigli, in 1893, revived the old idea of dividing the pubic bone at one side of the symphysis instead of dividing the symphysis itself.

The operation has been taken up with enthusiasm in many quarters and, for the present at least, has almost driven the rival operation of symphysiotomy from the field. There are still some well-known operators, however, who cling to the latter operation, among them being Pinard, Zweifel, and Kerr.

Technic.—The operation was first performed by the open method; *i.e.*, the entire width of the bone was exposed, the saw being used under the guidance of the eye. This method deprives the severed bone and also the important soft structures posterior to the bone of all support.

Döderlein modified the operation by making the incision above the bone and completing the operation subcutaneously.

Bumm's method is entirely subcutaneous. No scalpel is used, the needle being entered just above the upper border of the bone and made to emerge just below the lower border.

Of these operations, that of Döderlein is probably the safest. It leaves to the severed bone and underlying tissues the support of the soft parts and at the same time permits the introduction of the finger to separate the tissues and guide the needle (Fig. 395).

The preparations are much the same as for symphysiotomy, but to the instruments already mentioned must be added two or three of the chain saws of Gigli. More than one of these are needed, since the instrument sometimes breaks, and without another the operator would be obliged to abandon the operation. The *porte scie*, or saw carrier, a long heavy needle with an eye in the point, is also required, though in an emergency its place may be taken by a long curved artery forceps.

An abundant supply of gauze for tampons should be at hand; also two or three pairs of rubber gloves, since the operator must change his gloves during the operation.

The patient is placed in the dorsal position with the legs flexed and

rotated outward. After making sure that the bladder is empty, the operator first carefully locates the symphysis and then the pubic spine. A transverse incision just above the pubic bone, extending inward from the pubic spine and large enough to admit the finger, is made. This incision is ordinarily on the left side, since, unless the operator is left-handed, he can work better on this side. It goes down to and through the fascia of the rectus muscle and no farther, since this is sufficient to give access to the posterior surface of the bone.

The left index finger is now introduced into the wound and the tissues

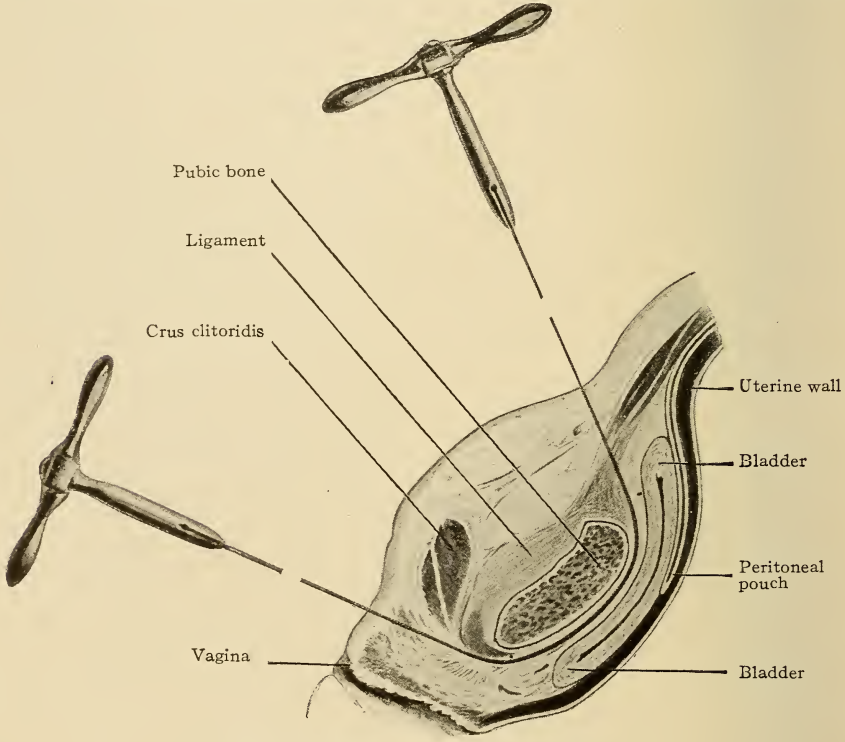

FIG. 395.—Pubiotomy, Döderlein's method.

separated from the posterior surface of the bone. The operator now takes in his right hand the needle of Döderlein and passes it along the posterior surface of the bone until it emerges at its inferior border. During its entire course the needle is kept close to the bone and its movements are guided and controlled by the finger of the left hand in the vagina.

The finger which has been introduced into the vagina should on no account be allowed to contaminate the pubiotomy wound. The operator, therefore, changes his gloves before proceeding further with the operation. One end of the saw is now attached to the lower end of the needle and

the latter is drawn upward until the saw appears in the upper incision. The handles are then attached and a few oscillations suffice to sever the bone. The saw should never be bent at an acute angle, but held as in Fig. 397.

Hemorrhage may be quite free, from both ends of the wound, but as in symphysiotomy is best controlled by compression. This compression should be continued for a day or two to prevent the formation of hæmatomata, which are very likely to develop after this operation. A firm tampon in the vagina serves the same purpose.

When the sawing through of the pubis is almost complete, the thighs

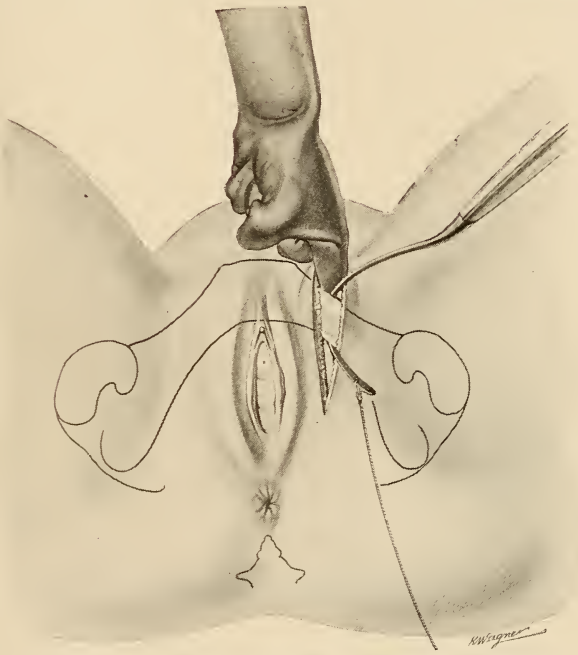

FIG. 396.—Pubiotomy, open method; passing the saw-carrier.

should be adducted and pressure made on each side by the assistants, who should be cautioned not to permit a too sudden or too great separation. It is not usually wise to permit a separation of more than 3 centimetres.

Delivery of the Fœtus.—What has been said of delivery after symphysiotomy applies here. If the head does not at once descend, it is far better to wait for an hour or two than to risk the severe lacerations that may be the result of operative delivery under these circumstances. Bumm, with a large experience in this field, emphasizes this point strongly. Version should be avoided as dangerous to the child as well as the mother, and likely to defeat the very object for which the operation is performed. If the use of the forceps becomes necessary, the same precautions are to

be observed as in the case of symphysiotomy. If delivery is to be delayed, the vagina should be tamponed, compresses applied to the cutaneous wounds, and the pelvis encircled by a firm bandage.

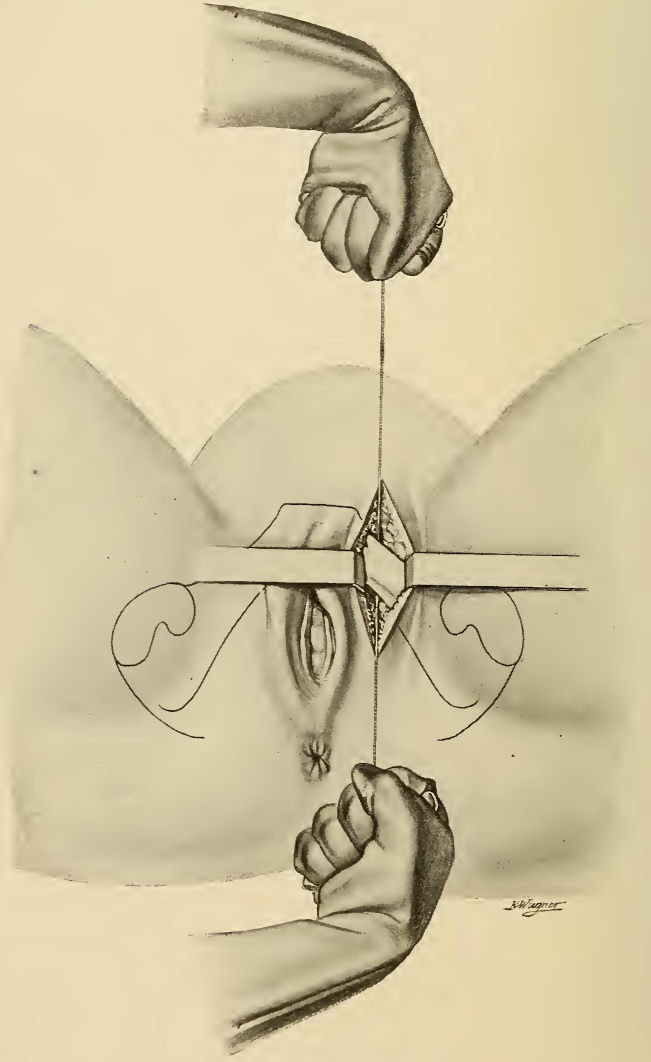

Fig. 397.—Pubiotomy, open method; the chain saw in use.

After-treatment.—It is better not to use the catheter unless absolutely necessary. The danger of cystitis is too great. Williams followed this plan in his cases and with good results. A wide strip of adhesive plaster, or the bandage of Garrigues, serves to immobilize the pelvis. The patient

is allowed to lie upon her side after the first day and to leave the bed in about two and one-half weeks (Fig. 398).

Indications.—The indications for these operations may be considered together. It is generally stated by those who advocate their use that they are indicated in flat pelvis, when the true conjugate is from 7 to 9 centimetres. My own experience leads me to believe that if the conjugate does not exceed 7 centimetres the Cæsarean section is preferable. The size of the head is such an uncertain factor that it is not well to approach the lower limit too closely. After all, it is not a matter of centimetres, but of the relation of the head to the pelvis, as shown by the test of labor. The thinking man does not reason in terms of centimetres, but takes into his estimate all the factors in the individual case.

Therefore, I do not advise either of these operations as an elective procedure. In other words, I would not choose one of them in advance, simply because the patient has a moderate contraction of the pelvis. Abundant experience has shown that in these border-line cases no one can determine the result in advance. How many times has an expected symphysiotomy terminated in a precipitate labor?

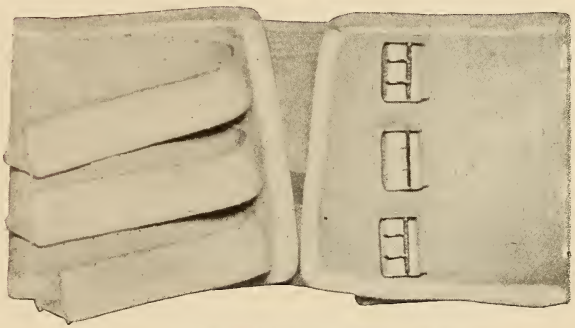

Fig. 398.—Garrigues's symphysiotomy bandage.

Viewed in proper perspective, a long list of pubiotomies performed by a good obstetric surgeon with a small maternal mortality, or perhaps none at all, proves simply this: that in competent hands and in selected cases such an operation is not necessarily fatal. When all is over, however, no one, not even the operator himself, knows how many operations were indicated.

Some enthusiasts have gone so far as to advise pubiotomy as a substitute for the forceps operation or version in these border-line cases. Those who recall the rapid rise, and still more rapid fall, of symphysiotomy must regard this view with skepticism. Then, too, it is highly significant that those who have had much experience with the operation advise that it be performed only by experienced operators. It is true that in the doubtful cases version is very often fatal to the child, but if the head can be made to engage, careful and tentative use of the axis-traction forceps can do no great harm, and gives the mother the benefit of the doubt. If the case is not infected, and if it is plain that pelvic contraction is the cause of delay, the Cæsarean section is far safer for the child, and equally safe for the mother. It is true that certain over-zealous advocates of pubiotomy will rejoin that the operation can only be judged fairly when it is performed

as an elective procedure. To this the obvious reply is that our obligations are to the patient and not to the operation.

A palpable disadvantage of both operations is the fact that the fate of the child is always doubtful. Even though the section of the symphysis or the division of the pubic bone has been skilfully performed, the subsequent delivery may prove unexpectedly difficult. The size of the head is always an uncertain factor. I have heard of one case in which, even after the division of the symphysis, the head could not be extracted until it had been perforated. This occurred at the hands of an exceptionally skilful operator.

At the last analysis, then, these operations are operations of necessity, not of choice. If circumstances permit us to determine our course in advance, it is better to perform the Cæsarean section and be fairly certain of a living child.

There is, however, a certain class of cases, very limited in number, it is true, but definite, in which the indication for opening the pelvis is clear. If the head is wedged in the pelvis, so that a little loosening of the pelvic diameters is all that is necessary, if the child is living and viable, if the condition of the mother, as to asepsis and resisting power, contra-indicates the Cæsarean section, and if a careful trial of the forceps by a good operator has failed, it would seem that pubiotomy or symphysiotomy is indicated. Such cases are rare indeed. They are most commonly the result of an overlooked outlet contraction, or of a face or brow presentation, or a persistent occiput posterior. To undertake either of these operations simply because the pelvic diameters fall within certain limits, or because the head remains above the brim of the pelvis, seems to me to pass the limit of justifiable experimentation.

It goes without saying that the child must be living and viable, and that the cause of delay must be pelvic contraction, and not some other and remediable condition. The one exception to this is to be found in cases in which the cause is a large head, or the presentation of one of the greater diameters, as in face or brow presentation. In these cases, of course, the pelvis is relatively if not actually small and the indication is really of the same character.

Which of these operations shall be chosen? Symphysiotomy opens the pelvic girdle more promptly and widely. This is certainly an advantage, but in the class of cases of which I have spoken the extra space allowed by pubiotomy, about 3 or 4 centimetres, is ordinarily sufficient.

It is claimed that in pubiotomy there is less danger of lacerating the adjacent soft parts, bladder, urethra and anterior vaginal wall. This is doubtful. Pubiotomy, however, has one undeniably great advantage. The bony wound usually heals promptly like a simple fracture, and thus there is less likelihood of subsequent disability, the after-treatment is less tedious and troublesome, and convalescence is much less prolonged.

If we must choose between the two operations, the latter considerations

settle the question in favor of pubiotomy. In my opinion the necessity for the choice will seldom arise.

Prognosis of the Two Operations.—With reference to prognosis, statistics are very confusing and unsatisfactory. It was at first claimed that pubiotomy is much safer than symphysiotomy, but this conclusion, which is *a priori* improbable, has been shown to be incorrect.

The combined statistics of Maier (1907) and Schlafli (1909) give an average mortality of 5.21 per cent. This refers, however, to the early days of the operation, before its technic was perfected. Later statistics from the German clinics, and from Johns Hopkins Hospital, indicate that the mortality in good hands should not exceed 2 per cent., and Williams is probably correct in saying that the mortality is about the same as that of the elective Cæsarean section. The fetal mortality is, of course, much higher.

An analysis of recent statistics goes to show that the mortality of symphysiotomy is about the same, though convalescence is much more prolonged.

But the above mortality presupposes that the patient is uninfected and all the conditions favorable, and the question naturally arises, "Why, under such conditions, perform these operations at all?"

Who Shall Perform the Operation?

We are accustomed to hear the statement that only an experienced surgeon should perform these operations. I would reverse the proposition and say that only an obstetrician should have the case in charge. First, and most important, he alone will be able to determine whether the operation is indicated. Moreover, the difficult and critical part of the operation is not the division of the symphysis or the pubic bone, but the subsequent delivery of the fœtus. This should certainly be in charge of an expert obstetrical operator, if such can be procured. It is during this period that the danger to both mother and fœtus is greatest; to the fœtus from asphyxia, and to the mother from extensive lacerations of the unsupported structures behind the symphysis.

I cannot too strongly emphasize this point, which I have had abundant opportunity to confirm from personal observation.

CHAPTER XXXI

EMBRYOTOMY

By the term *embryotomy* is meant the mutilation of the fœtus for the purpose of effecting a delivery which would otherwise be difficult or impossible. The term is a generic one, and includes various subdefinitions, *e.g.,* craniotomy, perforation, decapitation, evisceration, cleidotomy (division of the clavicle), etc., terms that for the most part explain themselves. The term craniotomy, which means the perforation or crushing of the fetal cranium, is often used as a synonym for embryotomy. This use of the term is objectionable, not only because it is bad English, but because it leads to confusion in the mind of the student.

Indications.—At the outset we are met by the question, "Are we justified in performing embryotomy upon the living fœtus under any circumstances?" This is an ethical, rather than a scientific, question, and one upon which I do not propose to enter. Here, as elsewhere, the physician must be guided by the dictates of conscience. The majority of physicians believe that there are occasional instances in which the sacrifice of the child is the only method of saving the life of the mother, and that in such cases it is justifiable.

The necessity for such a choice should never arise in a hospital, except perhaps in the case of a patient exhausted or infected when admitted. The Cæsarean section has now become so safe that the deliberate and premeditated destruction of a living child seems altogether unjustifiable.

In remote localities, however, where the attendant is without the assistance and appliances for an aseptic and reasonably skilful operation, he may be obliged to sacrifice the child or lose both patients. This painful necessity may occasionally arise as the result of pelvic contraction, of hydrocephalus, of brow presentation, or of face presentation with the chin posterior.

If the head is impacted in the pelvis, and the attendant has some surgical skill, he may venture a pubiotomy.

These emergencies would seldom occur if patients were taught that they should not wait until labor begins before consulting a physician, and if all physicians realized the importance of perfecting themselves in antepartum diagnosis, and of examining their patients before the beginning of labor.

Repeated embryotomies upon the same patient usually indicate a poor obstetric equipment as well as a criminal disregard for human life.

Physicians living in country districts should combine to establish emergency hospitals in which cases of this kind could be treated. In every group of a half dozen physicians there is at least one who has a special

aptitude for surgery. Some great achievements in surgery have been performed in just such emergency hospitals in our own country, and I believe that the plan here outlined would diminish, or almost abolish, the necessity for embryotomy upon the living child.

Whatever one may think about craniotomy upon the living fœtus, there can be no doubt that craniotomy upon the dead fœtus should be performed much oftener than it is. What are the indications for embryotomy upon the dead fœtus?

In a general way, it may be said that whenever the fœtus is dead and an operation of even moderate difficulty seems required for its delivery, embryotomy should be practised. But we must be sure that the child is dead. How are we to ascertain this? Absence of the fetal heart-sounds, of course, is not sufficient evidence of the death of the child. If, however, they have been heard shortly before their absence it is highly significant. The only positive evidence is prolonged absence of pulsation in the umbilical cord. Hence the following cardinal rule: Before any severe operation is performed for the purpose of effecting delivery, we should avail ourselves of every opportunity to determine whether the fœtus is living, including, if possible, palpation of the cord, which can usually be practised when the head is movable above the brim and certainly in all versions.

Nothing can be more stupid and cruel than to subject the mother to severe laceration, with possible subsequent disability and perhaps fatal infection, in order to avoid the necessity of perforating a dead fœtus, and yet it cannot be doubted that this has many times been done.

Perhaps the most typical instance is found in those cases in which frantic and unavailing efforts are made to deliver the after-coming head long after the child is dead and the cord has become cold and pulseless.

I was once called in haste to deliver a patient because of prolapse of the cord. The head presented. There was no doubt of the diagnosis, but noticing the small size of the abdomen, I inquired the date of the last menstruation, and learned that the patient was only six and one-half months pregnant. Obviously there was no need of operative interference.

Contra-indications.—If the true conjugate measures less than five and one-half centimetres, the operation is impossible. If less than seven centimetres, it is at least as dangerous as the Cæsarean section. Cervical dilatation is, of course, necessary, and if the cervix is not completely dilated, dilatation should be completed manually or otherwise.

Technic.—Craniotomy, the most common form, will be first considered. It is divided into two stages: first, perforation and evacuation of the skull; second, extraction.

First Stage.—Bladder and rectum should be empty. All available room is needed. Asepsis should be rigorous, since these cases seem peculiarly likely to be followed by infection. Such an operation should never be performed in bed. The patient should be in the lithotomy position with the hips drawn well over the edge of the table. It is hardly necessary to

say that the membranes should be ruptured and the cervix dilated. Anæsthesia is not always necessary, but if it is not used the nature of the operation should be carefully concealed from the mother. If it is used, ether is usually to be preferred in these neglected and exhausted cases. Instruments necessary are the perforator of Blot or Simpson, the cranio-

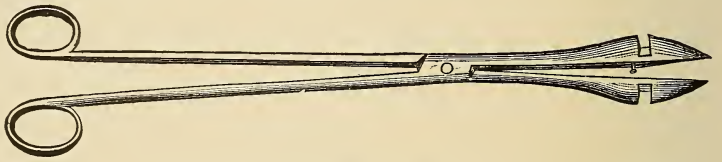

Fig. 399.—Simpson's perforator.

clast of Braun, and in difficult cases the basiotribe of Tarnier. The perforator of Blot is much to be preferred to that of Simpson, especially in difficult cases, since it cannot injure maternal tissues or the fingers of the operator. He who possesses a basiotribe needs neither perforator nor cranioclast, since both are contained in this instrument.

When all is ready, a final examination is made to determine the exact condition of affairs and make sure that the operation is really necessary.

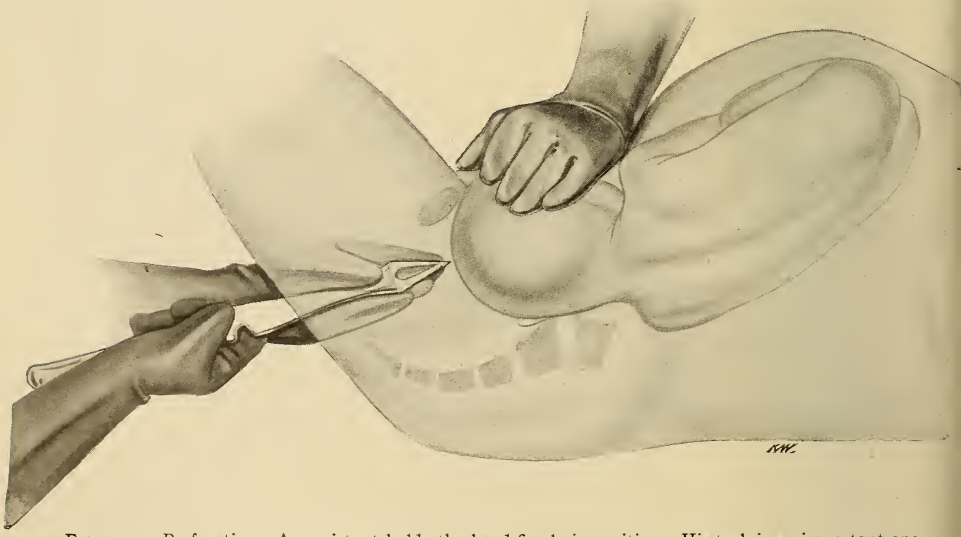

Fig. 400.—Perforation. An assistant holds the head firmly in position. His task is an important one.

An assistant then firmly presses the head down (Fig. 400) into the brim of the pelvis and holds it there. The point of the perforator is kept as nearly as possible at right angles with the skull and is made to penetrate the skull by a "boring" movement. But little force is required. If the Simpson instrument is used, great care must be taken not to injure the maternal soft parts. In an emergency any long, straight scissors may

be made to serve every purpose. Whatever instrument is used it should be held lightly, but firmly, against the skull and the guiding fingers of the left hand should not leave their position until the instrument has become buried within the cranium. The blades are then separated and moved about in all directions, thus breaking up the brain substance and facilitating its

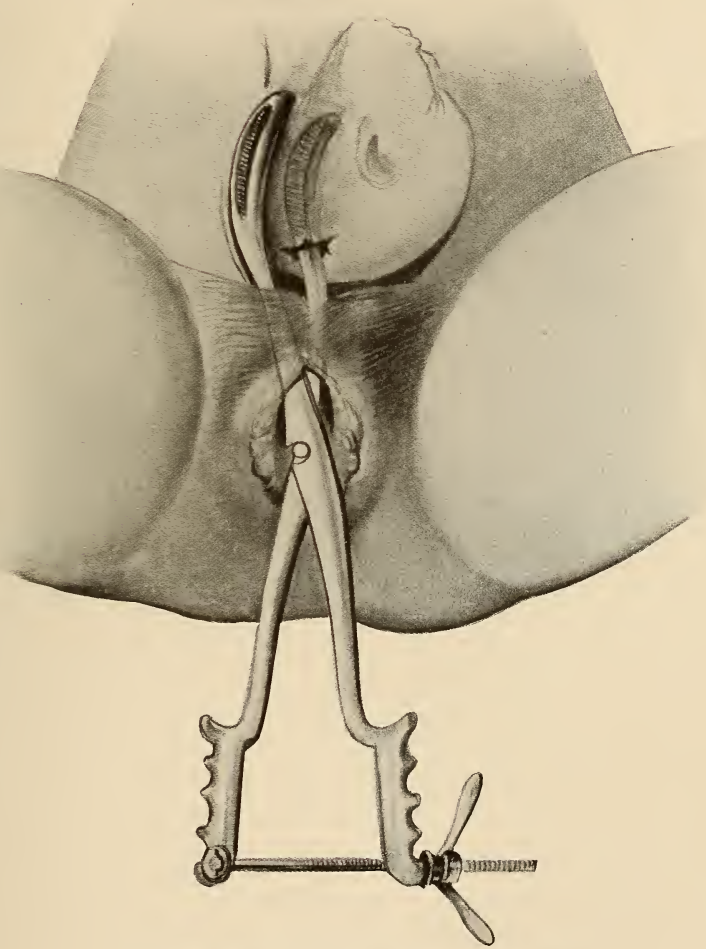

Fig. 401.—Cranioclast of Braun and method of using.

evacuation. This process should be especially vigorous in the neighborhood of the medulla and base of the brain, in order to avoid the possibility of the birth of a living but mutilated child.

It is better to perforate a bone than a fontanelle, since the latter may close again. In vertex presentations the puncture should, if practicable, be made near the occiput. This promotes flexion when traction is made

with the cranioclast, and thus the mechanism of labor is more closely imitated. After perforation the scalp should be so arranged as to cover ragged edges of bone. It is a waste of time to wash out the cavity of the skull, since the cranial contents exude freely as compression is made.

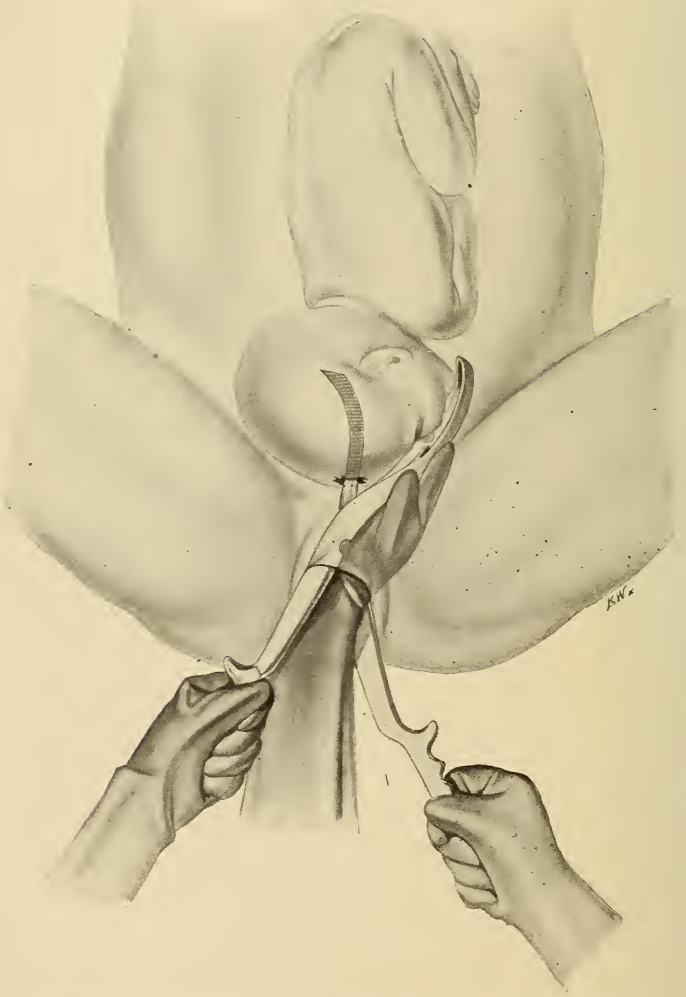

FIG. 402.—Application of the cranioclast in brow presentation. An assistant holds the right blade well back and to one side, while the operator applies the other blade over the face.

EXTRACTION.—The head having been perforated and the cranial contents evacuated, there still remains the task of extraction. In some cases this is easy and may be accomplished by the ordinary obstetric forceps. In others it is unexpectedly difficult and may tax the resources of an experienced operator.

For this purpose many instruments have been devised. Two only have stood the test of time. These are the cephalotribe and the cranioclast. The cephalotribe is in substance a massive and powerful pair of forceps, designed for both crushing and extracting. The heavy blades, however, take up considerable space, and when the head is compressed in one of its diameters it is often proportionately elongated in another. It is now

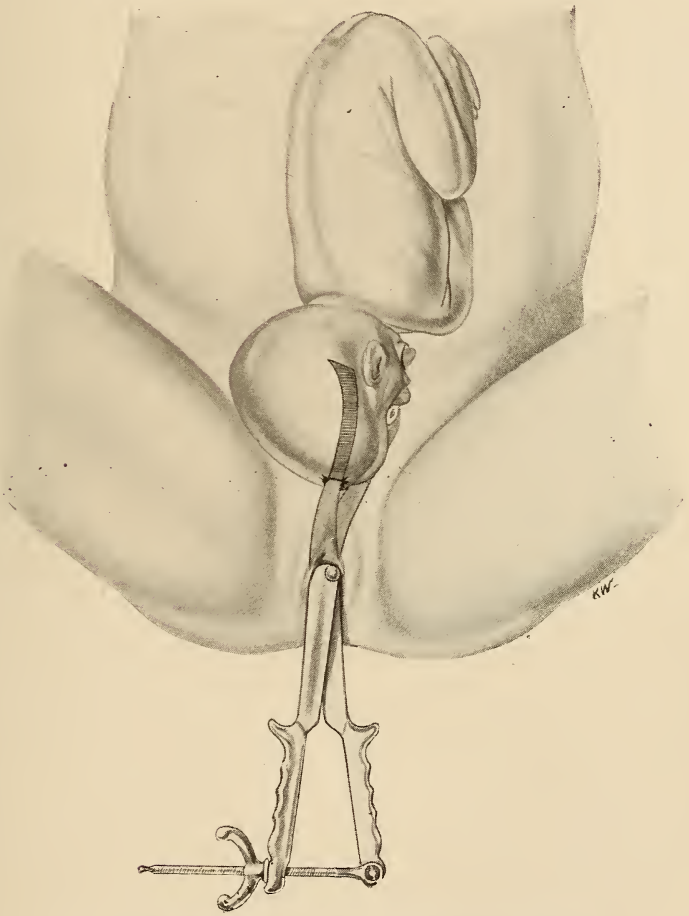

FIG. 403.—Cranioclast applied and handles screwed together.

seldom used, except in cases in which it becomes necessary to crush the base of the skull, and even here the basiotribe, to be described presently, is much more effective.

A more practical and useful instrument is the cranioclast of Braun (Fig. 401), whose construction and appearance are here sufficiently illustrated. Since one of its blades is passed within the cavity of the skull

and the other is buried in the tissues of the scalp or face, it takes up practically no room and adds nothing to the bulk of the head. Furthermore, it is easier of application, and its application is attended with less maternal traumatism. As suggested by Mundé the cranioclast is really a craniotractor, and should have been so named. True, it may be and sometimes is used to comminute the cranial vault, but this use is incidental or accessory, its chief function being to make traction upon the fetal head. Under the influence of this traction, the head, having been emptied of its contents, becomes elongated and moulded to the shape of the pelvic canal, as shown in Figs. 402 and 403.

Cranioclasis

The extraction of the head by means of the cranioclast is known as cranioclasis. The inner or non-fenestrated blade is first introduced. This is carried under the guidance of the fingers through the perforation already made in the skull and held in position by an assistant. The location of the perforation should vary with the position of the head. In occiput positions it should be near the occiput so as to favor flexion. In face presentation it should be at the root of the nose, in order that when traction is made extension of the head and descent of the chin may occur. To recount every possible contingency would carry us too far. The following illustrations will serve to refresh the memory and make plain the principle involved.

Though intended primarily for traction the cranioclast is often used for comminuting the bones of the cranial vault, thus reducing its size and rendering its passage easier. The instrument remains *in situ* during the process and is moved about from one place to another, comminuting successive portions of the scalp as they can be reached. No attempt is made to remove the pieces of bone. These are left covered by the scalp, and the fact that they are so covered should be determined by examination.

Traction is made as far as possible in the axis of the pelvis. A steady pull, longer than in the forceps operation, is allowable, and indeed advisable. Thus is the head elongated and moulded. The operator should guard against slipping, and the force employed should be moderate.

Extraction with the cranioclast is not always easy, even when evidence of pelvic contraction is absent. The head may be very large or may present unfavorably, or there may be undetermined factors of difficulty. For example, when the head is impacted in the pelvic brim it is not always easy to determine with what kind of pelvis one has to deal.

In these cases the inexperienced operator sometimes redoubles his efforts. It is unwise to persist in unavailing efforts which can only result in increased shock. It is better to resort to version. The head, now diminished in size, presents no great obstacle to the seizure of a foot or knee, and if the uterus is not tetanically contracted the after-coming head is easily extracted.

If, owing to the scanty pelvic space, difficulty is encountered in reaching a foot or knee, the patient should be turned upon her side. I recall a case in which this manœuvre was successful after all previous attempts at delivery had failed and was, I believe, the means of saving the life of the patient.

Cephalotripsy

The process of crushing the head, or some part of it, by means of the cephalotribe, is known as cephalotripsy. As in the forceps operation, the head may be above or below the brim of the pelvis. In the former case we speak of high cephalotripsy, and in the latter of median or low cephalotripsy. Let us begin with the latter.

Median and Low Cephalotripsy.—Whenever possible, the blades are applied to the sides of the head, as in the forceps operation. They are then slowly and gradually approximated by means of the compression screw. Extraction should be slow and no effort made to drag the head through

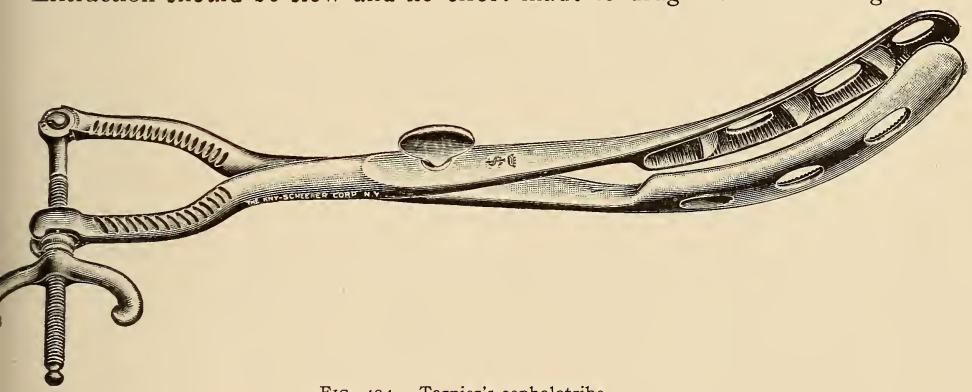

Fig. 404.—Tarnier's cephalotribe.

the pelvis by brute force. Frequent examinations should be made to determine the presence of projecting spiculæ of bone.

High Cephalotripsy.—Here, as in the forceps operation, and for the same reasons, no attempt should be made to apply the blades to the sides of the head, but the latter should be seized, if possible, by one of its oblique diameters. Extraction with the cephalotribe may prove difficult or impossible, and it is better, if difficulty is encountered, to substitute the cranioclast or to perform version. If practicable, such a patient should be transported to a hospital where basiotripsy may be performed by an expert (Fig. 404).

Basiotripsy

With perforator and cranioclast one may evacuate the skull and even break up and remove the cranial vault. There remains, however, the base of the skull, and if the conjugate diameter of the pelvic brim be less than 5½ or 6 centimetres this can hardly pass.

The base, then, must be reduced in size. For this purpose the best instrument is the basiotribe of Tarnier. The process of crushing and extracting the head by means of this instrument is known as basiotripsy.

The basiotribe is a combined perforator and crusher of the skull. It consists of three parts, a perforator and two blades, which together constitute a powerful cephalotribe (Fig. 405).

If the blades of the cephalotribe could always be applied accurately to the sides of the head, the crushing of the base of the skull would be a simple matter. When, however, the head is above the brim, as it usually is in these difficult cases, an exact cephalic application is impracticable. The genius of Tarnier was not long in overcoming this difficulty. He gave the basiotribe a double lock. This enables the operator to make either

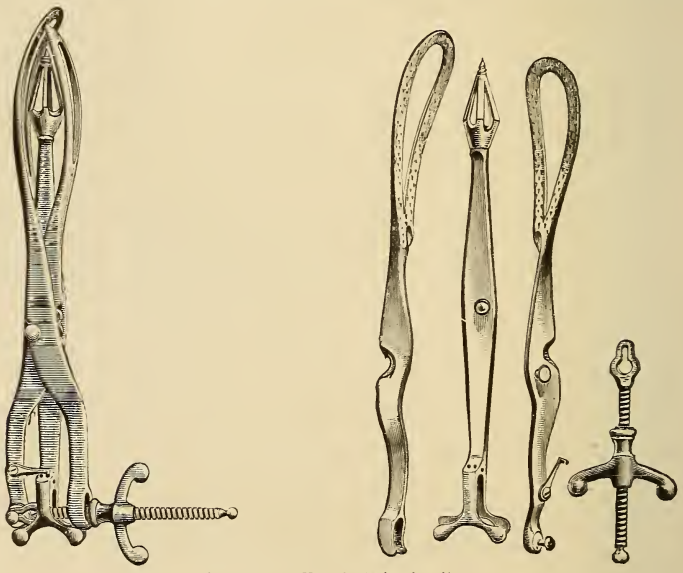

Fig. 405.—Tarnier's basiotribe.

blade longer at will and thus to apply the instrument effectively, no matter what the position of the head (Fig. 406).

Technic.—The perforation of the skull and the evacuation of its contents are accomplished as in an ordinary craniotomy. Perforation may be made with the central branch of the basiotribe, which is in itself a perforator. This is carried to the base of the skull, and the handle brought as far back as the perineum will allow and entrusted to an assistant.

The blades are introduced according to the rules already given for the forceps operation. If the occiput is to the left, the left blade is introduced first, and *vice versa*. As in the forceps operation, if the head is above the brim, the blades are applied obliquely. One blade will be over the mastoid region and the other over the opposite temple. After the first

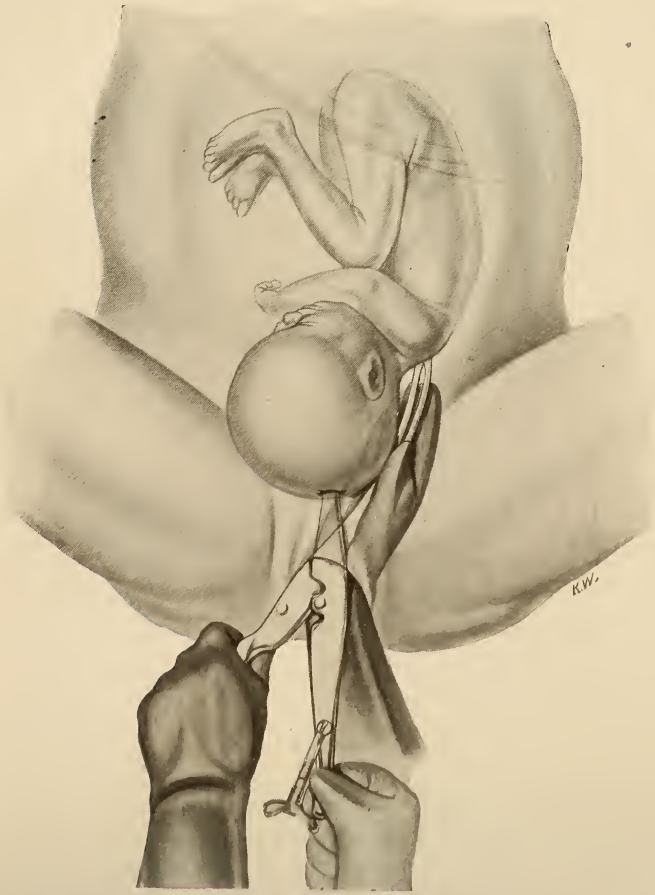

FIG. 406.—Use of the Tarnier basiotribe. Introducing the left blade and locking it to the perforator.

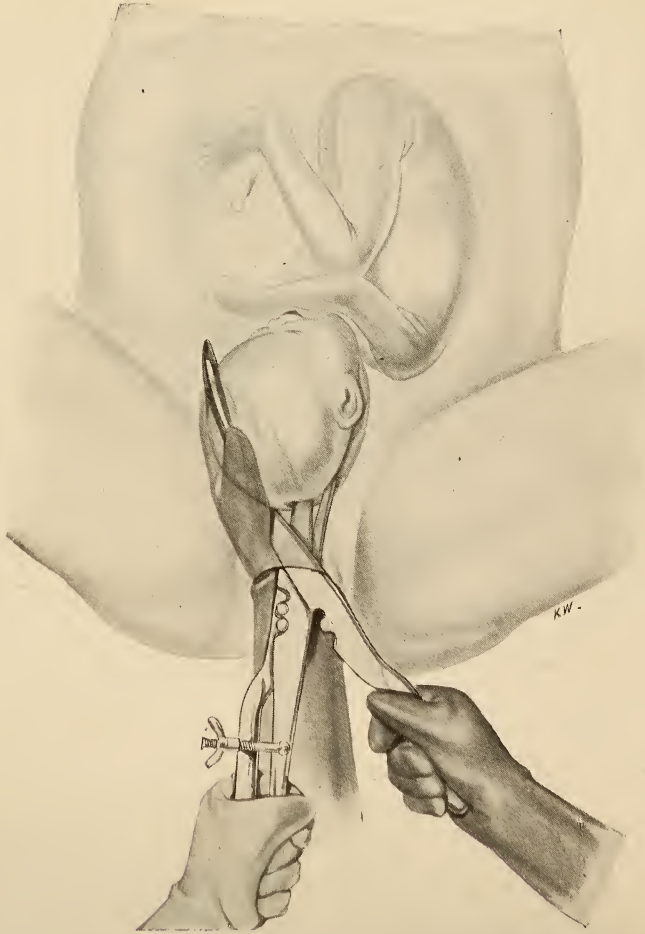

FIG. 407.—Tarnier's basiotribe. Introduction of right blade.

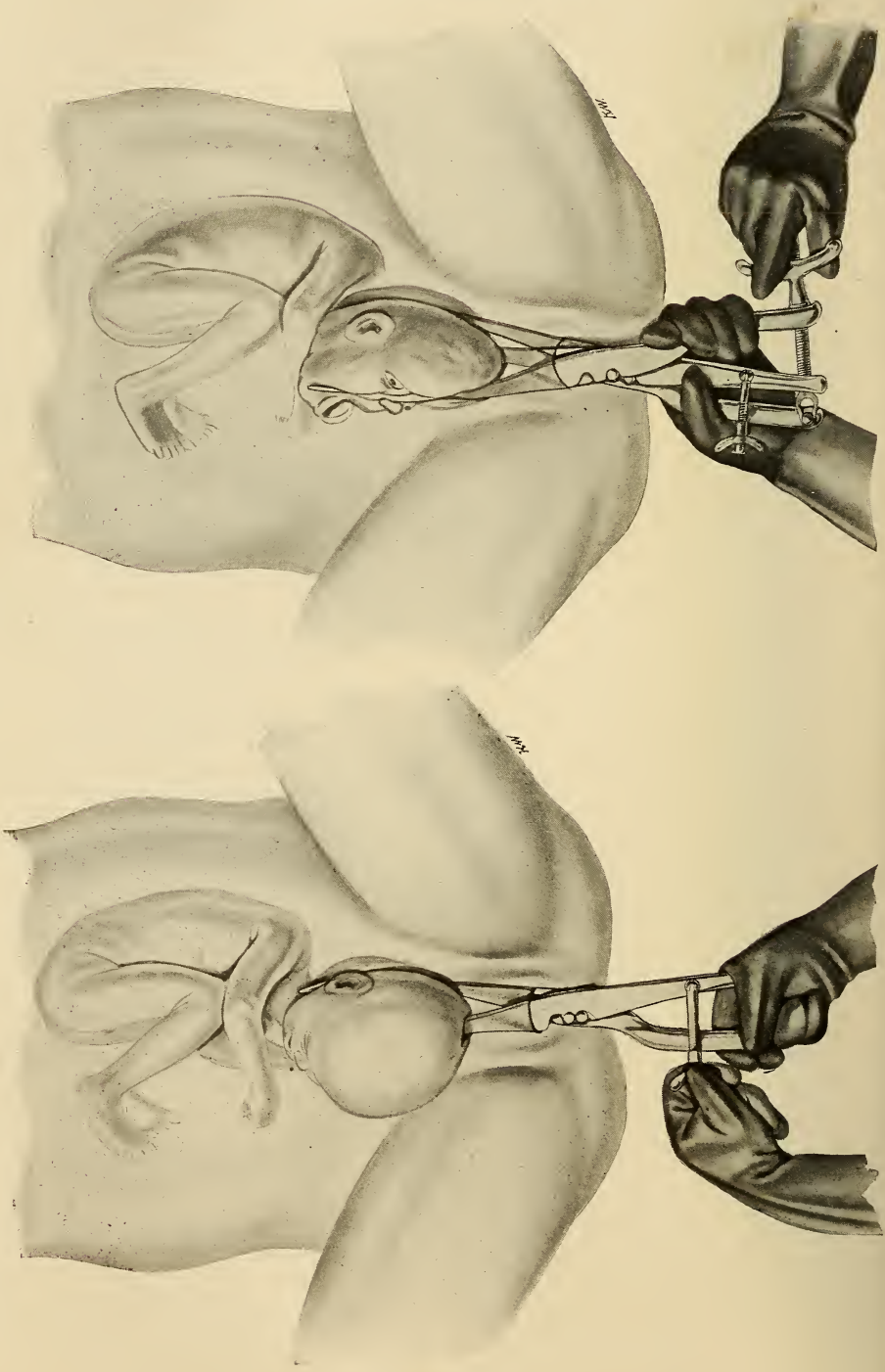

FIG. 408.—Tarnier's basiotribe. Crushing of occiput.

FIG. 409.—Tarnier's basiotribe. Extreme compression.

blade has been passed it is locked to the perforator, and by compression with the small screw the occipital region is crushed (Fig. 408). The

FIG. 410.—Basiotribe extraction.

second blade is now introduced, the pivot being inserted into the slot nearest the handle. This causes the second blade to penetrate more deeply and to embrace the entire circumference of the head, face and chin. This

deeper insertion of the second blade, which is the distinguishing feature of the Tarnier instrument, not only makes it possible to reach the chin and crush the base of the skull, but also serves to prevent slipping, which would otherwise be unavoidable. The remainder of the crushing process is now accomplished by means of the larger compression screw (Fig. 409).

This description, necessarily somewhat technical, will be made, I think, perfectly clear by the accompanying illustrations (Figs. 406–410) from Jeannin, who advises that if extraction prove difficult, which is rarely the case, the first blade be withdrawn and the second be used articulated with the perforator as one would use the cranioclast of Braun.

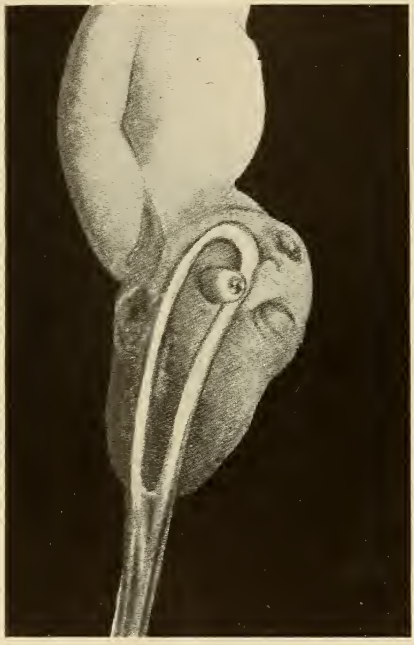

FIG. 411.—Aspect of fetal head extracted by means of the basiotribe.

In face presentation the perforation should be in the neighborhood of an orbit, while in presentation of the brow it should be in the region of the large fontanelle. The blades are applied as already described.

In basiotripsy of the after-coming head it may be possible to apply the blades transversely, and in this case it is, of course, better to use the slot near the end, making both blades of the same length.

Here an assistant, making traction upon the breech, pulls the trunk strongly downward and to one side, while the perforator is carried through the occipital bone near the posterolateral fontanelle. If great disproportion exists, one cannot always reach this fontanelle. In such cases the trunk may be carried upward over the mother's abdomen, and the head perforated through the roof of the mouth or through the foramen magnum. The latter is, in my experience, the easier.

DECAPITATION

This is called for in neglected cases of transverse position, when the membranes have ruptured early and uterine retraction renders version impracticable or dangerous.

Technic.—The bladder and rectum having been emptied, the first step, as in all these procedures, is to fix the presenting part, which in this case is the shoulder, at the brim; in these cases, however, not as in vertex presentations by pressure from above, but by traction from below. We

have an excellent traction handle in the arm. In many of these cases the hand has become prolapsed and is found in the vagina or protruding from the vulva. Even when this is not the case, it is usually easy to find it and to bring it down.

While strong traction is made upon the hand and arm by an assistant, the operator encircles the neck with his left hand, and taking in his right a pair of long, strong, blunt-pointed scissors, like those of Dubois, makes a small incision in the most accessible part of the neck. Into this the scissors are gradually introduced, dividing the soft structures of the neck until the operator recognizes the resistance of the cervical vertebræ. The spinal column is severed by successive "bites" of the scissors. Meanwhile the left hand guides and controls the movements of the instrument and makes sure that it remains covered by the soft structures of the neck (Fig. 412). These structures should not be severed until after the cervical column has been divided, and it is perhaps better in difficult cases to leave the column unsevered until the extraction of the trunk, when it will either tear without harm or become easy of access.

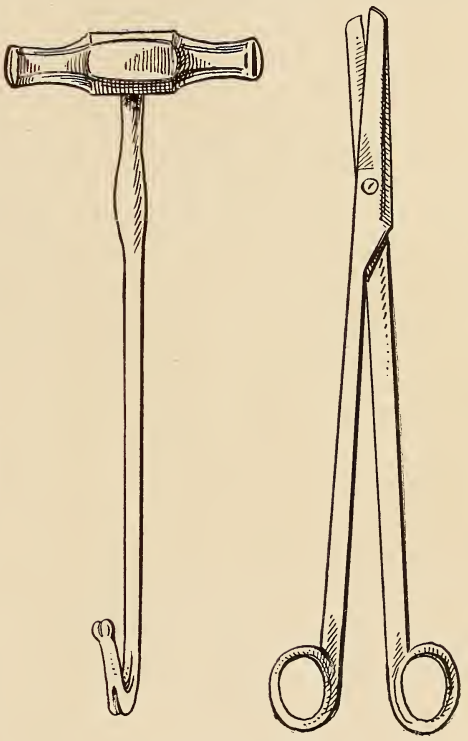

Fig. 412.—Scissors of Dubois and crotchet of Braun.

Extraction of the body is most conveniently effected by traction upon the arms (Fig. 415).

When the neck is difficult of access we may have recourse to the crotchet of Braun. This famous instrument may be used for two purposes: first, for bringing the neck within reach of the scissors, and second, to sever the spinal column.

By traction upon the arm, the neck is made as accessible as possible, and under the guidance of the left hand the crotchet is made to encircle the neck and its handle then entrusted to an assistant, who makes traction while the operator proceeds to use the scissors, as already described (Fig. 414).

If the operator does not succeed with the scissors, it remains to disarticulate the cervical vertebræ, which is accomplished in the following manner: Seizing the handle of the crotchet, he makes traction as strong

as is deemed safe and then rotates the handle, first to one side and then to the other, the whole process being carefully controlled by the full hand introduced into the vagina and high as necessary. As considerable force is required, this manœuvre should be reserved for those difficult cases in which one cannot succeed by the method already described (Fig. 413).

Extraction of the Trunk.—This is best effected by traction on the

Fig. 413.—The use of Braun's hook.

arm, and here little difficulty is usually experienced, though in rare cases version may prove the easier method. Extraction of the head, however, may prove a more difficult matter.

The retention of the separated head *in utero* is a complication occasionally encountered by the practitioner, not only in cases of the kind here considered, but in other cases. For example, the head is sometimes sepa-

rated from the body in clumsy and ill-advised efforts to deliver the after-coming head. This happens quite frequently in the case of a premature or macerated fœtus, and if the operator is unprepared for the emergency he may find himself in an awkward position.

The head should be fixed at the brim by external pressure. *This is absolutely essential.* If it is not so fixed, every attempt to grasp it or to

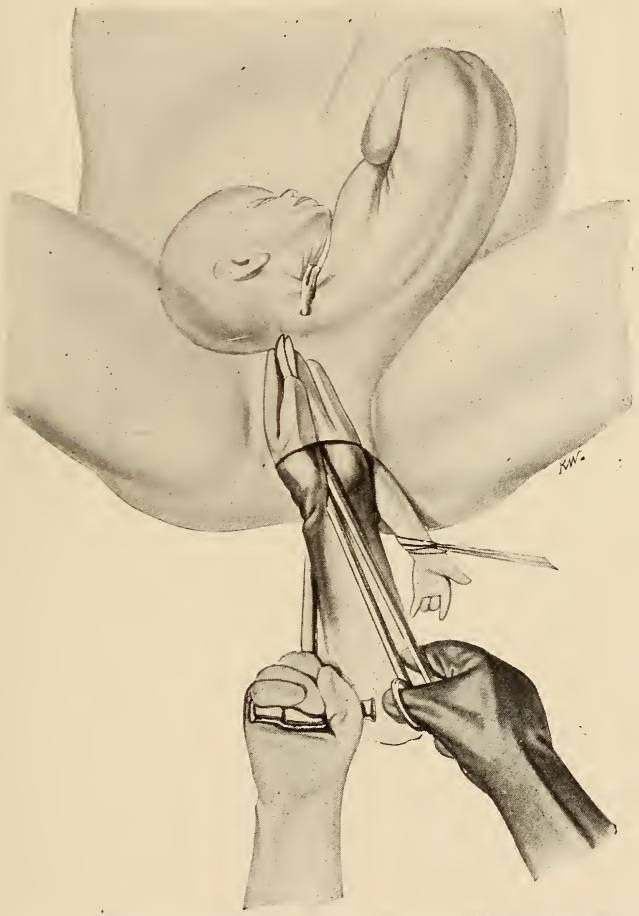

FIG. 414.—Assistant holds handle of the crochet during the use of scissors.

perforate it simply pushes it away from the brim and the labors of the operator are indefinitely prolonged. The bladder should be reëmptied if necessary.

While the head is held firmly in position by an assistant the operator proceeds with its extraction. If the head is small the task is easy. It is only necessary to pass the hand into the vagina and to make traction upon

the lower jaw or, as I recall in one case, to make traction with the finger passed through the foramen magnum.

If the pelvis is contracted, or the head of unusual size, craniotomy or

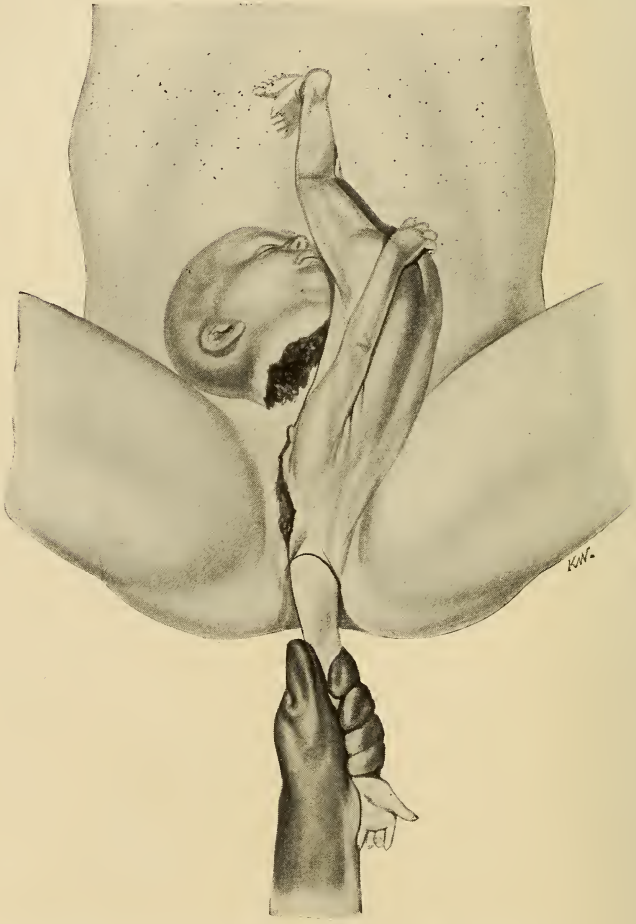

Fig. 415.—Extraction of tne fetal body after decapitation.

even basiotripsy may be performed according to the rules already given, the assistant constantly bearing in mind the absolute necessity of keeping the head fixed at the brim.

Evisceration

In rare cases it is impossible to reach the neck. Here the spinal column must be severed at a lower level. It is the thoracic vertebræ that must be disarticulated—here one must perforce undertake the gruesome task of

removing the thoracic viscera in order to make the spinal column accessible.

Technic.—Strong traction is made upon the arm. This makes the axilla accessible, and it is at this point that the opening is made into the thoracic cavity. Here again we use the scissors of Dubois, always guided and controlled by the internal hand as already described. The opening made by the scissors serves to permit the introduction of the hand, and the heart and lungs are removed in order to permit greater freedom of manipulation. The vertebræ are then disarticulated, using the scissors, if possible, as involving less shock and traumatism than the crotchet. According to Fabre the section is much more easily made if directed obliquely toward the subclavicular depression of the opposite side than if made directly transversely. In the former case one arm will be attached to the upper section and one to the lower (Fig. 416).

Fig. 416.—Embryotomy, oblique section.

In certain cases, fortunately rare, the body of the fœtus is crowded into the lower uterine segment and the latter is dangerously thinned. The shoulder is entirely out of reach. Even to attempt to reach the neck would subject the distended lower uterine segment to dangerous tension. Nothing remains but to eviscerate the fœtus, which usually presents by the abdomen or one of the flanks. By this manœuvre the size of the fœtus is diminished and distention of the lower uterine segment lessened. The spinal column may now be severed if within easy reach. If the task proves difficult, however, it is best not to persevere, since the evisceration makes the trunk as a whole so flexible that version is usually easy (Jeannin). In some cases the back presents. In this case it is easy to sever the spinal column and this precedes the evisceration. Counter-pressure should not be forgotten.

Very exceptionally the whole fœtus is retained above the ring of Bandl, the latter remaining contracted and interposing a serious obstacle to the efforts of the accoucheur. The condition may be regarded as a sort of hour-glass contraction before delivery.

If version is impossible, the operator may succeed in reaching the neck

and dividing it by one of the methods already mentioned. If not, his only remaining resource is to eviscerate the fœtus and disarticulate the spinal column wherever it can be most easily reached. Since the fœtus occupies the thick muscular portion of the uterus, the danger of rupture is less than in the case last considered. But the task of dilating the ring of Bandl, of severing the fetal trunk and extracting the severed parts, is a long and wearisome one, involving a prolongation of the anæsthesia and, as a rule, profound shock.

Cleidotomy

By this term is meant the division of one or both clavicles. It is employed when, in the case of the dead fœtus, the head has been born but the breadth and bulk of the shoulders effectually prevent delivery.

Technic.—The head being forcibly extended by an assistant, the clavicle is severed by means of long, strong, blunt-pointed scissors. It is obvious that the nearer to the sternum it is divided, the more will the bisacromial diameter be shortened. According to Edgar this diameter may be shortened 1½ inches or more by section of the clavicles.

PART IV

PATHOLOGY OF THE PUERPERIUM

CHAPTER XXXII

PUERPERAL INFECTION

This ancient enemy of womanhood, now happily disarmed, is nothing more nor less than ordinary wound infection, not differing in cause or essential nature from infection as we find it in general surgery. It is, however, so modified by location and attendant circumstances that its diagnosis is somewhat more difficult, and its treatment quite different from that of other kinds of infection. A clear comprehension of these facts at the outset will materially aid the student and practitioner.

Historical Note.—Various fantastic speculations were indulged in by writers of the sixteenth and seventeenth centuries as to the origin and nature of this affection. In England, in the latter part of the eighteenth century, White and Gordon proclaimed puerperal fever, as it was then called, a contagious disease; and in our own country Oliver Wendell Holmes, writing in 1843, eloquently insisted upon this view. It remained, however, for Semmelweiss, of Vienna, in 1847, not only to grasp the true meaning of puerperal infection, but above all to put his theories into practice. His experiments, carried on at the great maternity hospital of Vienna, proved conclusively the truth of his ideas, but like all reformers he was subjected to persecution and ridicule, and his discovery was not recognized until long after his death. A monument in the church cemetery at Budapest gives tardy recognition to one of the world's Immortals.

The birthplace of antiseptic midwifery in the United States is the New York City Maternity Hospital, Blackwell's Island, where the antiseptic system was introduced by Garrigues in 1883. Even at this late date he was made the subject of reproach and ridicule, nor has he yet received the recognition which is his due. Honor to his memory!

Frequency.—It is almost impossible to determine the frequency with which puerperal infection occurs. The clinical history of the condition and the methods of its diagnosis are not well understood. Moreover, there is a natural disinclination to accept the diagnosis of infection when some other plausible reason can be found for the symptoms. I would not assert, as some writers have had the temerity to do, that many physicians in private practice willingly practise deception in this matter, while those connected with hospitals invariably view their cases with judicial impartiality. This has not been my observation. There is, however, no doubt that hospital records afford the best basis for comparison, since in private practice the majority of physicians keep no records at all.

In the pre-antiseptic period more or less infection was always present in the great hospitals, *e.g.,* the Hôtel Dieu in Paris and the Vienna Maternity, the mortality ranging from 2 to 6 per cent., and in epidemics reaching 10 or even 15 per cent. The mortality in well-conducted hospitals is now less than 1 per cent.

At the New York Maternity Hospital in the years 1875 to 1882, inclusive, the mortality ranged from 2.63 per cent. to 6.67 per cent. In the first nine months of 1883 the mortality was still greater, 6.71 per cent. On October 1 Garrigues instituted the antiseptic treatment and during the three following months there were 102 deliveries without mortality, which, as Garrigues says, seemed at that time "little short of miraculous." In the ten succeeding years the total mortality was less than 1 per cent. Surely, there was never a better demonstration of the priceless value of the new teaching.

I am forced to disagree emphatically with those who assert that the mortality in private practice is as great as it was in the pre-antiseptic days. Certainly this is not true of New York and vicinity, especially in the case of recent graduates of our colleges and hospitals, whom I have had ample opportunity to observe, and who, as a rule, endeavor to apply the principles of asepsis. Nor do I often note in their practice cases of virulent infection. Moreover, in former times epidemics were not confined to hospitals, but occurred in the outside world as well. Both kinds of epidemics have happily disappeared.

The question has now become one of morbidity rather than mortality. The figures are difficult to determine. Considering every rise of temperature to 100.4 as denoting infection, Bumm estimates the hospital morbidity as 20 per cent. This seems to me rather higher than in our hospitals here. Perhaps the difference, if difference there be, is due to the fact that in Europe trained nursing, as we know it, simply does not exist.

Classification.—Broadly speaking, all varieties of puerperal infection may be classified under two heads, sapræmia and septicæmia. It is true that, from a technical stand-point, this classification leaves much to be desired, since, strictly speaking, sapræmia is an intoxication rather than an infection, and since various observers, *e.g.,* Bumm, von Franquè, and Williams, have found streptococci in cases which would clinically be classed as sapræmia. Nevertheless, the division is one of great practical value. The majority of cases of infection may be divided clinically into two principal classes. In one—sapræmia—the predominating symptoms are those of intoxication by putrefactive organisms; in the other, the clinical picture is that of septic infection. These two classes of cases differ materially in diagnosis, prognosis, and treatment, and hence present a good clinical basis for comparison. The fact that streptococci are found in cases of apparent sapræmia is a theoretical, rather than practical, objection, since it is evident that in these cases the organisms are not of virulent type. Sapræmia is a condition by itself. Septicæmia is multiform in its

manifestations. Let us examine these two forms of infection a little more closely, first disposing of sapræmia, and then taking up the classification and symptomatology of true septic infection.

Sapræmia

Sapræmia (from the Greek σαπρω, to decompose), putrid intoxication, *Wundintoxikation* of the Germans, is by far the most common form of puerperal infection. It is the result of the presence *in utero* of decomposing animal matter, fragments of placenta, membranes, blood clots, or lochial discharge. This decomposition is due to the fact that the saprophytes, bacteria of decomposition, have gained access to the uterus. These organisms are universally present in atmospheric air, and are the cause of decomposition as we see it everywhere in dead animal matter. This decomposition will occur in the uterus, as elsewhere, if saprophytes are admitted to its cavity, just as it will in a can of meat if the lid is removed and air with its contained saprophytes is permitted to enter. Just as in the can, the contents remain sweet until the cover is removed, so the placenta may remain sterile and harmless *in utero* for weeks if the organisms of decomposition do not gain admittance.

How do they gain admittance? A lax uterus and wide open cervix are predisposing causes. Shreds of membrane hanging from the vulva make a ladder by means of which they may ascend from the vagina to the uterus. Premature rupture of the membranes allows free entrance of the organisms into the uterine cavity even before the completion of labor. More often, in all probability, they are carried upward by unnecessary douches or examinations, since they are always present at the introitus and about the vulva, and are often found in the vagina.

Retention of Lochia.—There is another predisposing cause of sapræmia of which mention must be made here—retention of the lochial discharge, or lochiometra, as it is called. In these cases the normal anteversion of the pregnant uterus is so much exaggerated that the angle formed by the body of the uterus and the lower uterine segment is so acute that the lochia are confined within the uterine cavity. In some cases the distention of the uterus causes severe pain and there is a sharp rise of pulse and temperature. The uterus has a "boggy" feel, which has been compared to that of pregnancy. The lochia are absent. The symptoms usually develop toward the end of the first week and are due partly to the reflex influence of uterine distention, and partly to the decomposition of retained lochia. If the extreme anteversion is corrected by traction on the anterior cervical lip combined with suprapubic pressure, there is a gush of foul-smelling lochia and the symptoms are relieved. This condition should always be borne in mind when symptoms apparently serious develop toward the end of the first week.

Clinical History of Sapræmia.—Let us suppose that we have before us a fairly well-marked case. Three or four days after delivery the

patient complains of headache, which is often a prominent symptom, and the temperature rises to 102 or 103 degrees. The chilly sensations that usually go with rising fever are present, but there is, as a rule, no distinct chill. The pulse is not very rapid, perhaps 100 to 110. Palpation shows that the fundus is higher than it should be and the uterus larger, but there is no great tenderness, or "bogginess," as in the case of the more severe forms. The lochia are abundant and have a foul odor. The cervix is patulous and easily admits one or even two fingers. The cavity of the uterus contains ill-smelling débris, placental fragments, shreds of membrane, or decomposing clots. The face is often darkly flushed and the expression one of discomfort and annoyance rather than of serious illness. The clinical picture here presented is a typical one, but the picture may vary. Now and then there may be a severe chill at the outset and the temperature may reach 104. More often, there is but little fever, 100 or 101, and even this may last only for a day or two, the *Eintagsfieber* of the Germans. The red lochia are abundant, and after-pains are likely to be present with the discharge of ill-smelling clots. The duration of an attack of sapræmia varies from a few days to a week or even more, but with proper treatment the symptoms usually disappear in a few days. Very often there is but little fever, 100 or 101, and even this may last but a day or two.

Puerperal Septicæmia (Bacteræmia)

Septicæmia differs from sapræmia fundamentally in that the offending organisms have the power of reproducing themselves to an indefinite degree, of entering the lymphatics and the general circulation, and of migrating to distant parts of the body, there to continue their unhappy work. Thus we see that septicæmia is, or at least may become, a general disease, while sapræmia is a local condition.

By far the most frequent offender is the streptococcus, familiar to every student as the cause of erysipelas, pyæmia, septicæmia, etc.

Other pyogenic organisms less frequently found are the staphylococcus, the gonococcus, the colon bacillus, and the pneumococcus.

There is no reason why puerperal wounds, like other wounds, should not become the nidus of any infectious germ, and so we have as curiosities, occasionally encountered, cases of infection by the bacillus of tetanus, the typhoid bacillus, the diphtheria bacillus, the bacillus of tuberculosis, etc.

Strictly speaking, all these conditions do not come within the definition of puerperal septicæmia. For example, the colon bacillus and the bacilli of tetanus and diphtheria occupy a middle position. They possess only moderate invasive properties, do not usually travel farther than the outer layers of the wounds which they infect, and, like the saprophytes, affect the organism by the liberation of their toxins, rather than by themselves invading distant localities.

The same thing may be said of infection by the gas bacillus (*Bacillus*

aërogenes capsulatus), the organism which is the cause of *tympania uteri*. This organism, though usually behaving as a saprophyte, may occasionally produce a true septicæmia.

It seems better, however, to include infections by these organisms in the category of puerperal septicæmia, since they offer a more serious prognosis than does pure sapræmia.

Etiology.—In the birth canal, as elsewhere, wound infection may be caused by the presence of any one of a large number of microörganisms; or the infection may be of the mixed variety, two or more organisms being present. We have already discussed the rôle of the saprophytes in the production of sapræmia, but we still have to deal with the larger and more complex subject of septicæmia.

Let it be understood at the outset that puerperal infection is not a specific disease, and that there is no specific organism concerned. Here, however, as in general surgery, the streptococcus is by far the most frequent offender. This is already known to the reader as the cause of erysipelatous inflammation, of most abscesses, and of suppuration in general. Next in order of frequency come the gonococcus and staphylococcus, in the order mentioned, and at a much greater distance the colon bacillus and the pneumococcus.

How do the bacteria gain access to the puerperal wounds?

By contact, as in other varieties of wound infection. The sources of contact are the hands of the accoucheur, or nurse, instruments and dressings that are not sterile, fecal contamination, the unskilled interference of abortionists and midwives, copulation at or near the time of labor, douches carelessly or improperly given, tub-bathing just before or during labor, etc.

Doubtless the hand, as the instrument most often used, and the most difficult to disinfect, is the usual medium of infection. Next would come instruments and dressings, and, much less frequently, the various irregular and uncommon varieties of septic contact that defy orderly arrangement. The one important thing to remember is that in practically all cases the infective material is introduced from without, and that therefore puerperal infection is a preventable disease.

The uterus after delivery, with its warmth and moisture, its raw surfaces, and its necrotic content, seems to afford ideal conditions for bacterial development. Our methods of disinfection are, at the best, imperfect, and are in some cases, it must be admitted, carelessly applied. Moreover, many cases do well in which no precautions whatever are taken. This of course is no excuse for carelessness, but it indicates that we should study and respect the methods of nature in limiting infection.

What these methods are, we know only in part. That they exist, however, is beyond all doubt. König has shown that the acid secretion of the vagina is antagonistic to the germs of infection. Doubtless the flushing of the birth canal with blood and liquor amnii, which follows every labor,

performs the part of an aseptic irrigation. Then, too, the contraction of the uterus which normally follows delivery empties the organ of all débris and, if continued, keeps it empty.

These facts afford useful therapeutic hints which are considered elsewhere.

The bacteriology of the vagina has been the subject of much careful study of late years, notably by Döderlein, König and Menge, in Germany, and in our own country by Whitridge Williams, but the results have been variable. Williams holds, as the result of his work, that pyogenic cocci are not normally found in the vagina of pregnant women, and that the only pyogenic coccus that can flourish in the vaginal secretion is the gonococcus.

Personally, I believe that Williams is correct in this matter, for it seems impossible to avoid the belief that, if pyogenic cocci were normally present in the vagina, puerperal infection would be far more common. Moreover, we know from experience that in gonorrhœal cases infection will not infrequently occur even though the labor be conducted in an aseptic manner.

But this is not auto-infection, since the gonococci, of course, came originally from without. This also applies to possible cases of interstitial endometritis existing before pregnancy (Hirst), and rupture of an old pyosalpinx during labor.

Even if pyogenic organisms are found in the vagina, it would seem that they must, for the most part, have lost their virulence.

Franz and others believe that anaërobic saprophytes are normally present in the vagina and may, under certain circumstances, make their way into the uterus and cause fever of a mild type, lasting only a day or two, even when there has been no internal manipulation or penetration of any kind. The nature of these organisms is by no means well understood, nor has their infectious character been proven, and from what we know of nature's conservative processes in normal labor, the idea of an infectious property in physiological maternal secretions seems *a priori* improbable.

The identity and influence of the various organisms which are found in the birth canal have recently become favorite subjects of study, and a great mass of literature has accumulated which it would be unprofitable to attempt to review here. It is noticeable that the subject has so engaged the attention of many writers, that they have neglected the serious clinical study of the various types of infection with reference to diagnosis and treatment.

The student and practitioner are apt to become bewildered in trying to draw practical conclusions from a mass of more or less reliable data, and the effort to remember too much often results in the lack of any knowledge of the subject.

The following facts seem to me to be well established:

1. That in the vast majority of cases the birth canal does not contain virulent cocci, and that if such organisms do gain entrance to the vagina they are best dealt with by the forces of nature.

2. That puerperal infection is usually streptococcus infection.

3. That, with the exception of gonorrhœal cases, infection almost always comes from without, and that the possibility of auto-infection in the strict sense of the term has not been proven.

4. That in view of the marked difference of opinion among bacteriologists, clinical experience must, as heretofore, remain the final test in matters of diagnosis and treatment.

Classification.—The common method of classifying the different varieties of puerperal infection according to their location or, so to speak, topographically, beginning at the vulva and going on from vulvitis to vaginitis, cervicitis, endometritis, etc., has always seemed to me a very poor one—one which would only occur to the purely library or laboratory student, and which seems grotesque and unnatural to the man who spends much time in the hospital ward or the lying-in chamber. It certainly gives to the inexperienced a wrong perspective, and leads the student to an entirely incorrect view of the relative frequency and importance of the different varieties. One does not usually find ocular demonstration of puerperal infection by inspecting the vulva. The matter is not as simple as that.

Let us then begin our observations where infection usually begins, *i.e.*, at the endometrium, or, to speak still more definitely, at the placental site. Here is a raw surface freshly denuded, here are sinuses that open into the general circulatory stream, here are the lymphatic channels that lead to the parametrium and the general peritoneum.

Puerperal infection, as we see it in the everyday practice of medicine, and especially as the general practitioner most often sees it, begins as a putrid endometritis (sapræmia) or as a septic (usually streptococcic) endometritis. Doubtless it is usually, at the last analysis, a mixed infection, since in sapræmia, streptococci, though not of a very virulent character, are often present, and streptococcic infection is often complicated by the intrusion of the omnipresent saprophytes. At the bedside, however, the distinction is usually plain enough.

It is true that tears of the perineum and vagina do not always heal by first intention, but this delay in healing, while technically it may constitute puerperal infection, since it is the infection of a puerperal wound, has, as a rule, little or no effect upon the general condition. Pulse and temperature remain unaltered. The thick mucous membrane of the vagina has little absorptive power, and convalescence is not materially delayed. The uterus is not specially enlarged or tender and the appetite and general condition are good. The vaginal discharge is increased, and the proximity of the saprophytes insures a foul odor. The inflammation may be simply catarrhal in character, as indicated by redness and abundant secretion, or it may be diphtheroid in character, *i.e.*, the affected surface, usually the site of an unhealed perineal tear, is covered with a grayish, false membrane, consisting of necrotic tissue separated by a granulation layer

from the sound tissues underneath. This was formerly an everyday occurrence in hospitals—the puerperal ulcer of the older writers. One seldom sees it nowadays.

As a rule, these local infections involve little or no danger, though mistaken zeal in treatment may carry the infectious process to the endometrium, and thus work incalculable harm.

Sapræmia we have already considered. Generally speaking there is but one variety of sapræmia, different cases differing in degree rather than in kind or location. It is true that saprophytes about the vulva or in the vagina may lend a bad odor to the lochia, but in these cases the general condition is affected very little or not at all.

The guiding principle to be observed in any scheme of classification is the fact that the saprophytes confine their activities to the uterine cavity.

In septicæmia, on the other hand, the organisms have invasive properties which may cause the extension of the infective process beyond the birth canal. This extension may occur by means of the lymphatics, the veins, and rarely, as in salpingitis, by the mucous membrane; or, in other words, by "continuity of tissue."

In the great majority of cases infection is transmitted by way of the endometrium. There is one important exception which the reader should not overlook. Infection, as we shall presently see, is often transmitted directly to the parametrium through the medium of a cervical tear, and by way of the lymphatics of the broad ligament.

Including then, for the sake of convenience, the condition which we call sapræmia, and which is an intoxication rather than an infection, we may classify the different forms as follows:

ENDOMETRITIS

Let us now consider a typical case of true septic endometritis. Symptoms that attract attention usually appear on the third or fourth day after delivery, but careful observation will show that there is often a subfebrile temperature of 100 or 100½ as early as the second day, and that even at this time there is a moderate acceleration of the pulse. The scene opens, usually, with a well-marked chill, which is followed by a high temperature, 103 or 104, and a rapid pulse, 120 or 130. The rapidity of the pulse is the most significant of all the symptoms and is in striking contrast with the comparatively slow pulse of sapræmic infection. The face is pallid rather than flushed. The patient looks seriously ill, but does not complain of pain, in fact, often expresses herself as feeling quite well.

Locally the symptoms are not marked at first. Involution does not progress and the fundus remains high, but there is no great tenderness on pressure. Massage of the uterus does not, as usual, produce contractions. The lochia are at first abundant, but soon lose their bright red color and become mixed with a purulent discharge. If high temperature persists, the discharge becomes scanty or even disappears altogether. In cases of

pure streptococcic infection there is little or no odor to the lochia. The cervix admits the finger but is not as soft and patulous as is the case in sapræmia. The uterine cavity is empty. Bacteriological examination shows the presence of streptococci in the uterine lochia.

The further course of the disease depends upon the virulence of the infective organisms. In some cases, now happily rare, the general condition becomes rapidly worse and the patient dies in a few days as the result of a profound toxæmia.

More commonly the process becomes localized in the uterine wall as a metritis. In any case of severe and long-continued endometritis, one suspects involvement of the uterine wall, if the uterus becomes large, boggy and sensitive, and especially if there is a profuse purulent discharge. All the structures of the uterus may be involved. Large areas of muscular tissue may slough away (*metritis dessicans* of Garrigues) or abscesses may form beneath the peritoneal covering of the uterus, where the lymphatic supply is richest, with resulting adhesions, and attachment of the uterus to the intestine or abdominal wall. Both these occurrences are rare, however. More commonly there is simply a moderate infiltration of the uterine wall with leucocytes.

SALPINGITIS

Extension of the infectious process from the mucous membrane of the uterus to that of the tube by "continuity of tissue" would seem a very natural result, but as a matter of fact it does not occur as often as one would suppose. Bumm advances the not unreasonable hypothesis that the inflammatory swelling of the endometrium seals up the minute uterine aperture of the tube, thus preventing the entrance of the streptococci. Infection may be communicated to the tube through the lymphatics. Inflammation and even abscess of the ovary (oöphoritis) may also occur, usually, however, as part of a parametritis. In rare instances a ruptured follicle is directly infected by contaminated peritoneal fluid.

The local symptoms are most prominent. There are pain and rigidity at one side of the uterus, and internal examination discloses an extremely sensitive mass in one or the other *cul de sac*. General symptoms are for the most part lacking. There may be evidences of peritoneal irritation, *e.g.*, distention, vomiting, and peristaltic arrest, but these soon disappear.

PARAMETRITIS

Much more common than salpingitis is parametritis, by which is meant the inflammation of the peri-uterine connective tissue. Here again the infection is transmitted through the lymphatics, which lead directly from the uterine wall to the connective tissue of the parametrium and the broad ligaments. In many cases, probably in the majority of cases, the infection is transmitted directly to the parametrium through a cervical tear, and not

secondarily through the endometrium, but in both cases the lymphatics are the avenues of infection.

The symptoms usually appear about the third or fourth day, more rarely about the eighth or tenth. When they appear early they are usually due to a cervical tear. When later, they are secondary, and sometimes the result of unskilled or improper manipulations, *e.g.*, curettage, douches, and digital examinations, which reopen avenues of infection and defeat the efforts of nature to limit its extension. Leaving the bed too early is an occasional cause.

The first symptoms may be such as to excite much apprehension and may even lead the attendant to fear the development of a general peritonitis. There is often a chill followed by a temperature of 103 or 104 and a rapid pulse, 120 or more. There are also abdominal pain and distention, with perhaps vomiting, retention of urine, and peristaltic arrest. The pain, however, soon becomes localized at the side of the uterus, the threatening symptoms subside, and internal examination shows increased resistance at one side of the vaginal vault.

This increased resistance gradually develops into a well-marked exudate. The uterus is pushed over to the opposite side and loses its natural mobility. In rare cases the process involves both sides and the uterus is solidly fixed in a mass of exudate.

The further course of the disease depends upon whether the morbid process in the parametrium undergoes resolution, or goes on to suppuration. Fortunately the former is more common. In cases of resolution the high temperature may continue for from one to three weeks. Not longer than this, as a rule, unless the case goes on to suppuration. There are usually morning remissions, at least after the first few days. As time goes on, these remissions become more marked and there may even be an evening fever with normal temperature in the morning. This fact should never be forgotten, for, as was long ago noted by Lusk, if the physician does not see his patient in the evening, he may be under the impression that she has no fever at all.

Pus formation is indicated by chills, fever, and night-sweats. The tumor becomes more sensitive and softer. The pus may burrow in various directions. It is most likely to follow the pelvic connective tissue beneath the peritoneum of the anterior abdominal wall, appearing finally above Poupart's ligament, or in the connective tissue behind the cervix, or about the rectum. Recalling anatomical relations, the reader will remember that the connective tissue at the sides of the uterus is continuous with that in these locations. The abscess may point above Poupart's ligament, or, what is more common, the pus may gravitate downward and make its escape by way of the rectum, bladder or vagina.

Pus formation, however, is not limited to these situations, nor do the bacteria always regard anatomical limitations or follow the prescribed paths of least resistance. Now and then the pus dissects its way behind

the pubes and far up into the abdomen, the abscess "pointing" near the navel, or a psoas abscess may result, pointing below Poupart's ligament or even down the thigh.

In the pre-antiseptic days, when no precautions at all were taken, these abscesses were common enough. Now, happily, they are seldom seen. Many men in active practice there are who have never seen them at all.

The precautions now taken apparently diminish the virulence of the infecting organisms, even when they do not destroy them. In many cases the process is limited to a simple inflammatory œdema, the first stage in phlegmonous inflammation, which disappears in a week or so. Even if the process goes on to extensive exudation, the exudate is often absorbed.

PERIMETRITIS OR PELVIC PERITONITIS

It does not seem probable that an inflammation of the pelvic cellular tissue can exist without some accompanying involvement of the pelvic peritoneum. If, however, the latter is chiefly involved, the symptoms of peritonitis will predominate. In pelvic peritonitis the local signs are less prominent though by no means absent, but the general symptoms are, for a time at least, more ominous and severe. The initial chill is more pronounced, and the small wiry pulse of peritonitis at once attracts the attention. The fever is continuously high, *i.e.,* without the marked morning remissions of parametritis, vomiting may occur, and there may be some of the local evidences of peritonitis, *e.g.,* constipation followed perhaps by diarrhœa, retention of urine, and moderate abdominal distention. There may be marked sensitiveness to pressure in the lower abdomen, but evidences of tumor formation are not necessarily noted until the end of the first week.

The exudate in perimetritis is at a higher level than in cellulitis and is more central or bilateral. It can be palpated along the pelvic wall through the lower abdomen as a mass, characteristically irregular in outline. Internal examination shows that it is posterior to the cervix rather than to one side of it. Often it seems to surround the cervix in such a way that one cannot tell where cervix ends and uterus begins.

A significant sign is that noted by Garrigues, viz., that in the case of peritoneal exudate one can pass the fingers between the exudate and the pelvic wall, while the exudate of a cellulitis does not permit such introduction.

These are the chief diagnostic points, but the reader must not expect them to be well-marked in all cases, since the two conditions are so closely combined. The matter is of interest from a scientific, rather than a practical, stand-point, since there is little or no difference in the treatment.

If the patient has a bad cervical tear the condition is probably a parametritis.

The exudation in pelvic peritonitis does not usually become the seat of suppuration, and the symptoms usually subside within two or three weeks,

but even here suppuration may occur. The subsequent effect, however, is more unfavorable than in cellulitis. These patients often suffer from chronic disease of the appendages—the aftermath of a gonorrhœa. The great majority of cases of pelvic inflammation appearing late in the puerperium are of gonorrhœal origin.

GENERAL PERITONITIS

When the organisms are of very virulent type, the leucocytic barriers erected by nature are absent or inefficient, and the infection may extend to the general peritoneum. It is plain that the localization of the infectious process in the pelvic peritoneum is to be regarded as favorable; at least as far as the danger of death is concerned.

It is hardly necessary to rehearse here the symptoms of diffuse peritonitis already familiar to the reader. Characteristic of the puerperal form is the early appearance of the symptoms, usually within three or four days, and sometimes within a day or two, after delivery. The initial chill is long and severe, and the temperature is high, 104 or thereabouts. The small, rapid pulse, which is 120 from the start, warns even the careless observer that something serious is in progress. Soon the abdomen becomes distended and exquisitely tender, the descent of the diaphragm becomes restricted and painful, and the respirations much increased in frequency. The reflex disturbances resulting from overwhelming peritoneal irritation, *e.g.,* that most distressing symptom, constant vomiting and hiccough, constipation followed by diarrhœa, and sometimes retention of urine, combine to render the lot of the poor sufferer unbearable. He who has once witnessed this picture will think no precautions thrown away in an effort to prevent the possibility of its occurrence.

ACUTE SEPSIS (SEPTICÆMIA LYMPHATICA)

This is the most virulent of all the forms of infection. Its only redeeming feature, if such a process can be said to have a redeeming feature, is that pain is not a prominent symptom. Here the organisms pass directly into the circulation through the lymphatics, and there are no distinct evidences of localization. A futile effort at resistance on the part of nature is shown in the so-called lymphatic peritonitis, a beginning or abortive peritonitis, and similar manifestations are found in the pleura and pericardium, and in the synovial membranes of the large joints. Abscess formation does not occur. Bacteria are found in the blood in large numbers. There is cloudy swelling of the parenchyma of the viscera. This form of infection was a feature of the terrible epidemics that were observed in hospitals in pre-antiseptic times. It is now a rarity.

The initial chill is long and severe and the temperature is continuously high. There are no remissions. In some cases, however, the temperature is normal, or even subnormal. The pulse is high, 120 or more, and soon becomes weak. The face is pale, sometimes jaundiced. Often the pallor

is such that the patient looks as though she had had a hemorrhage, though the blood loss may have been but slight. The respirations are rapid, and there is a certain amount of dyspnœa, though not of the distressing kind that accompanies general peritonitis. Here the dyspnœa is the result, not of mechanical obstruction, but of the destruction of the red blood-corpuscles by the toxins. Sleeplessness, probably due to cerebral anæmia, is a prominent symptom. There is little or no pain and the mind is usually clear. Sometimes, indeed, the patient avows that she feels perfectly well (euphoria), though the pallor of the face and, above all things, the weak and rapid pulse speak otherwise to the experienced observer.

In contradistinction to the gravity of the general symptoms the local symptoms are slight. There may be moderate distention of the abdomen, but there is no special pain or tenderness. The lochial secretion is suppressed, and milk does not appear in the breasts. A rapidly fatal termination is the rule, death occurring perhaps in two or three days.

PUERPERAL PYÆMIA (SEPTIC PHLEBITIS, SEPTICÆMIA VENOSA)

In this condition the bacteria enter the circulation, not by means of the lymphatics, but through the venous system. The first step in the process is a metrophlebitis, *i.e.*, an inflammation of one of the uterine or pelvic veins. This in turn is caused by infection of a thrombus in the vein. Of course, thrombosis is not normal, but it is by no means uncommon, especially in cases of relaxed and flabby uterus. In such cases the walls of the sinuses at the placental site are not brought into contact, as in a well-contracted uterus, and the normal mechanism of thrombus prevention is absent. For the same reason, probably, pyæmia often follows infection which begins during labor, *e.g.*, after premature rupture of the membranes.

Of course, the infection of the thrombus usually occurs at the placental site. Hence it is, no doubt, that this variety of infection is most often noticed after placenta prævia, in which there is of necessity much manipulation about the placental site, and after the manual removal of the placenta or its prolonged retention. But these are not necessary to its production. It may follow a mild septic endometritis of uncertain origin and almost unnoticed symptoms.

Of course it is theoretically possible for a vein to be infected, because it is surrounded by infected tissue. In this case there is a proliferation of the endothelium with resulting thrombosis, but experience teaches us that thrombosis is not usually caused in this way.

Perhaps thrombosis is to be regarded as an effort of nature to prevent infection. At all events post-mortem examination has confirmed clinical experience, in showing that, as a rule, the thrombi at the placental site are but little affected even when the endometrium is the seat of severe inflammation.

Symptoms.—This form of infection presents a very definite and characteristic clinical picture. It is, however, so insidious in its onset,

and so deceptive in its course, that mistakes are often made. Hence it is obvious that it should be well studied by student and practitioner.

Unless the patient is in a hospital, or at all events unless the temperature is regularly taken, the early stages of the affection are usually overlooked. If, however, the case is carefully observed, a slight evening rise of temperature is observed after the first few days. It is not until about the end of the first week, or perhaps in the course of the second week, that serious symptoms become manifest. At this time the disease is announced by a well-marked chill followed by a high temperature, 104 or even higher. This in turn is succeeded by a profuse sweat, after which the patient seems to recover, and for a variable time feels as well as ever. The whole process reminds one strongly of an acute malarial attack, for which, indeed, it has many times been mistaken. The patient now seems to have recovered. The temperature and pulse are again practically normal, the appetite returns and the physician perhaps congratulates himself upon the prompt recovery of the patient. This deceitful truce, however, is of short duration. After a day or two another chill follows, and the same process is repeated.

Meanwhile local examination reveals little or nothing. The uterus is normal in size, and there is no tenderness on pressure. Involution appears to go on as usual. Slight tenderness and a doughy resistance may be felt over the affected vein, according to Bumm. Personally, I am inclined to believe that it is well to refrain from much manipulation, either external or internal, in these cases, on account of the danger of detaching a bit of the thrombus, thus leading to renewed infection, or possibly to embolism and sudden death.

Meanwhile, with recurring chills and sweats, the general health becomes affected. It is probable, though hardly susceptible of positive proof, that these chills represent the discharge of fragments of disintegrated thrombi, with their bacterial content, into the blood stream. At all events, examination of the blood during or shortly after a chill shows the presence of the organism.

Sooner or later the temperature remains somewhat elevated during the intervals. The intermittent fever has become remittent. The blood gradually becomes impoverished, the face pallid or jaundiced, the urine is scanty and contains albumen. The pulse is rapid and weak. In bad cases the dyspnœa, already mentioned in connection with acute sepsis, is present, but here it is a late, not an early symptom. It will be noticed that toward the end the symptoms are in fatal cases much the same as in acute sepsis, and here as there the toxins benumb the sensibilities. Nature herself seems to provide an anæsthetic for the cases that cannot be cured.

Most cases are complicated by metastatic processes, which may occur in any part of the body. This is easily explained, when we recall that fragments of disintegrating thrombi may at any moment be carried along with the venous current to distant organs and tissues. Thus we may have septic endocarditis, pneumonia, empyæmia, hydronephrosis, etc. The

glands may become affected, as in thyroiditis and parotitis, and there may be abscesses of the tonsils as well as abscesses of the subcutaneous connective tissue in any part of the body.

Of course, these metastases do not always take the form of abscess formation. Sometimes the process may be one of necrosis of the endothelium, fibrinous exudation, as in endocarditis, or serous exudation, as in the milder cases of synovitis.

It is obvious that to discuss all the occasional or possible complications of puerperal pyæmia would be impracticable as well as unnecessary. It must suffice here to mention briefly a few of the most common or characteristic. One of these is puerperal septic endocarditis.

Puerperal Septic Endocarditis

The bacteria in the blood stream have a tendency to collect upon the cardiac valves. Just why is not altogether clear. The left side of the heart is usually affected. Pre-existing endocarditis has been adduced as a predisposing cause, the bacteria collecting upon the valvular vegetations.

Symptoms.—Whatever the cause may be, the condition is sufficiently definite. The temperature remains high for the same reason that it does in acute sepsis, *i.e.,* because the bacteria are constantly discharged into the circulation and the toxins are constantly renewed in full measure. The pulse is rapid and dicrotic, and cardiac murmurs are usually heard, though they may be absent. Cerebral symptoms, headache, stupor, and even convulsions, are prominent, as might be expected, and the patient may die with symptoms of meningitis. A sad result, happily rare, is loss of vision from hemorrhage into the retina. Even panophthalmitis may occur with complete destruction of the eye.

The reader should remember that endocarditis may also occur in acute sepsis.

Metastatic abscesses are most common in the lungs and kidneys. A large embolus may block a large branch of the pulmonary artery and cause sudden death. Small fragments may cause only a temporary, though terrifying, asphyxia, followed by hæmoptysis. A purulent embolus deposited in the lung naturally leads to a secondary pneumonia, the so-called septic pneumonia. The physical signs are not typical but with care they can be found. The cause is not far to seek. "Pneumonia" in the puerperium is to be regarded with suspicion.

Purulent emboli in the kidney give rise to pus, blood and albumen in the urine and pain in the lumbar region, in fact, to the usual symptoms of hydronephrosis.

Septic Arthritis

The effusion may be either serous or purulent. The large joints are most often affected, usually the knee.

Diagnosis.—The diagnosis of pyæmia is more difficult than that of other varieties of infection. In the first week there may be no other

symptom than an evening temperature of perhaps 99.5 to 100.5. Here we have an illustration of the importance of taking the temperature regularly in all puerperal cases. If in a given case there is a slight evening fever during the first week, and especially if there is a history of any of the predisposing causes of pyæmia, *e.g.*, placenta prævia, or intrapartum infection, the attendant should be on his guard.

After one or two chills have occurred, the condition can hardly be mistaken for anything except intermittent malarial fever, which it resembles very closely. The latter as a complication of the puerperium is certainly very rare in New York and vicinity, but is not uncommon in other sections of our country. In the case of malaria, however, the blood will show the plasmodium, and improvement will follow the administration of quinine.

Prognosis.—Pyæmia infection, while offering a more favorable prognosis than acute sepsis, is always a serious condition, and even when recovery occurs it is usually only after a long illness. If some vitally important organ is involved the prognosis is, of course, much more serious. Endocarditis is usually fatal, and abscess of the lung, kidney, or liver, of course, highly dangerous.

PHLEGMASIA ALBA DOLENS (FEMORAL PHLEBITIS, MILK LEG)

This condition is still popularly called milk leg and was once supposed to be due to metastasis of milk from the breasts. In reality it is an extension of the thrombotic process from the pelvic veins to the femoral vein; in other words, a femoral phlebitis. The old term phlegmasia, however, has become so imbedded in the literature of the subject that it is not likely to be displaced.

Properly speaking, femoral phlebitis is merely a division of the general subject of puerperal pyæmia, but it has a distinctive symptomatology of its own, and for this reason is better considered separately.

The condition hardly ever goes on to suppuration, but there is usually sufficient phlegmonous inflammation to cause severe pain and marked tenderness on pressure in the femoral region. The veins may be palpated and recognized. The diagnosis is sufficiently easy without much handling of the parts, and this should be avoided on account of danger of embolism.

The symptoms of phlegmasia are both general and local. The general symptoms are at first the same as those that precede other forms of pyæmia, a slight evening rise of temperature often overlooked. These symptoms may subside altogether for a time, when in the second, or perhaps even the third, week the temperature again rises, perhaps to 103 or 104, the pulse becomes rapid, and severe pain in the femoral region with beginning swelling of the leg makes the diagnosis certain. The whole thigh and leg become swollen, smooth, rather firm, and of a milk-white color. The swelling usually begins at the ankle, and extends upward. The duration of this troublesome and painful affection is from four to six weeks.

There is another and much less common form of phlegmasia which is secondary to a pelvic cellulitis, and in which the swelling begins in the neighborhood of Poupart's ligament and extends downward.

There is also an aseptic thrombosis that may complicate the lying-in period, and may even occur before delivery. Predisposing causes are pressure of the pregnant uterus upon venous trunks, relaxation of the uterus, pelvic varicosities, etc. In these cases fever is absent and the condition is usually overlooked. There may or may not be more or less œdema and swelling of the leg, depending upon the location of the thrombus. Mahler has shown that in some cases the only symptom is a persistently rapid pulse, otherwise unexplainable. This is a very important clinical fact that should never escape the attention of the attendant, for in these cases there is always the danger of embolism. The rapidity of the pulse probably represents the effort of the heart to overcome the obstruction to the circulation.

The left leg is more commonly affected than the right, doubtless because of the greater frequency of varicosities in this member. Now and then both femoral veins are the seat of thrombosis and both legs are swollen. This, however, is fortunately rare.

The question has occurred to many, "Why does the thrombosis so often occur in the femoral rather than in other veins?" Widal's theory, that it is because the return current of blood is slowest at that point, especially when the patient first leaves her bed, seems satisfactory.

The treatment will be considered in connection with the general treatment of puerperal infection.

Diagnosis of Puerperal Infection.—The existence of fever during the lying-in period should be regarded as presumptive evidence of infection, unless it can be definitely accounted for. In this way we may occasionally make a diagnosis of infection when none exists, but if the attendant has sufficient experience and judgment to refrain from unnecessary operative treatment, or intra-uterine manipulations, no harm will be done. On the other hand, the increasingly favorable reports of the results of the serum and, occasionally, of the vaccine treatment, together with their apparent harmlessness, make it highly desirable that no time should be lost in cases of serious infection.

We should remember, however, that puerperal women, like other women, are subject to various causes of fever other than infection. I recall the case of a hospital patient who had been subjected to many examinations and diagnostic tests, including aspiration of the breast for pus, without result. An alveolar abscess finally revealed itself as the cause of the trouble. It was a case for the dentist, not the obstetrician. Now and then one finds a man so occupied with the idea of infection that he overlooks an influenza or a tonsillitis that could not possibly escape his notice at any other time.

The most common cause of non-septic fever in the puerperium is con-

stipation. The pulse is usually slow. The condition is promptly relieved by a cathartic.

Extreme distention of the breasts about the third or fourth day is a source of great discomfort to certain nervous and sensitive patients, and may be cause of fever, which disappears as soon as the breasts are emptied either by the baby, the breast pump, or massage.

Extreme mental and nervous excitement may now and then cause fever in hysterical and neurotic subjects, and these may also have disturbed cardiac action and rapid pulse, which serve to increase the anxiety of the attendant and the difficulty of diagnosis. Here, however, the history and demeanor of the patient, knowledge of the attendant circumstances, and the absence of all local signs of infection will aid in the diagnosis. Moreover, the condition is usually of short duration.

The possibility of intercurrent disease should not be forgotten, and in all doubtful cases a careful examination should be made. This should include auscultation of the chest, inspection of the throat, and examination of the blood for the bacillus of typhoid, the plasmodium of malaria, and in suspected cases for the spirochæta pallida of syphilis.

If one would be in line with progress and employ modern methods, bacteriological examination should not be forgotten. This embraces examination of the lochia and of the blood.

Bacteriological examination of the lochia alone is, to my mind, of theoretical rather than practical value. The mere presence of the bacteria does not necessarily mean much. It is a question of virulence rather than presence. Various kinds may be present in the same patient, and non-virulent streptococci are often found in the case of patients who present no symptoms of infection. Moreover, accomplished bacteriologists differ as to methods of technic. Krönig now believes that, using blood-agar as a culture, he can get positive results, but according to Zangemeister, Lea and others, this method by no means excludes the presence of virulent streptococci that are not hæmolytic in character.

Veit contents himself with securing the lochia from the upper part of the vagina, using the same technic as in taking cultures from the throat in suspected diphtheria, while in this country it is customary to take cultures from the interior of the uterus, following the technic of Williams and using the modification of the Döderlein tube. Under the strictest antiseptic precautions the cervix is exposed by means of a speculum and fixed by a tenaculum. The tube is then passed well within the internal os, the lochial secretion aspirated, the tube sealed, and the contents reserved for examination, or sent to a laboratory. Before passing the tube, the vaginal portion of the cervix is carefully cleansed with sterilized cotton and the greatest care is taken to avoid contact with the vaginal walls or with the external os.

Of course, no attempt should be made to explore the uterine interior if the cervix is closed and the uterus contracted. If there are ulcerated

patches about the vulva or vagina, but with no special evidence of endometritis, all intra-uterine manipulations should be avoided. The danger of transmitting infection to the uterine cavity is too great.

It should be noted, I believe, that the intra-uterine exploration is not absolutely free from the slight risk that attends all intra-uterine manipulations, and especially if practised by those unfamiliar with surgical technic, careless as to asepsis, or unfamiliar with the contra-indications to such manipulations. Franz found that in a large proportion of cases the procedure was followed by a rise of temperature, this being especially noticeable in the cases in which the streptococcus was present. Although his examinations were conducted with the most scrupulous care, he was led to discontinue them out of regard for the interests of his patients. Thomen also noted the occurrence of a chill and fever after bacteriological examination.

The method of Veit is not as reliable or accurate as that of Williams, but it is much easier, and somewhat safer, for general use. However uncertain it may be in some respects, it often gives useful information by revealing the presence of the gonococcus.

Much has been expected of blood examination, but thus far little has been realized. In acute cases, and in the last stages of pyæmic infection, the streptococci are found in large numbers. Many cases recover, however, when only scattered colonies are found in the blood.

The presence of streptococci in large numbers, then, is a bad prognostic sign, but in these cases the general symptoms alone are sufficient to show that the patient is in a very grave condition. Furthermore, as Williams has pointed out, many cases die without the presence of the streptococci in the blood and many recover when scattered colonies are found.

In this connection it should not be forgotten that the development of a leucocytosis during, and shortly after, labor and again at the time of the establishment of the milk secretion is a physiological phenomenon, and therefore not an evidence of infection.

Having excluded other causes of fever and thus reached the conclusion that the case before us is one of infection, we have to decide the important question, What is the type of infection? The ability to do this depends upon a knowledge of the varied clinical history of infection, which I advise every reader to study carefully, and upon the results of bacteriological examination, which, though as yet by no means infallible, renders valuable service in establishing or confirming the diagnosis in suitable cases, and especially in making the diagnosis of gonorrhœa.

Since, however, bacteriological examination is not infallible, and very often not available, it is highly important that the physician become familiar with the clinical history of puerperal infection. When this has been accomplished he will usually be able to diagnose the type of infection, if only by exclusion, though a few days may be required to clear up the matter. For example, if in a given case the pulse is slow and the general

condition good, the severe forms may safely be excluded. If there is no odor to the lochia the case is not one of sapræmia. Peri- and parametritis may be excluded at once by the absence of the physical signs. There have been no chills, or at best only a slight chill, or rigors at the beginning, therefore pyæmic infection is not probable. The symptoms began about the fourth day after delivery, which is rather late for most types of virulent infection, but early for pyæmia, etc. The case is probably one of mild streptococcic endometritis.

Or again, there is fever toward the end of the first, or at the beginning of the second, week, too late for most types of infection. Pyæmia, which usually begins at this time, is rendered improbable by the fact that the temperature is continuously high and without remissions or chills, though there may have been a chill at the beginning. In femoral phlebitis, which is often first noticed at about this time, there is pain in the thigh and œdema of the leg. There is another condition, however, which frequently causes a rise of temperature a week or two after delivery, namely mastitis. This leads the examiner to palpate the breasts. A point is found at which firm pressure elicits tenderness, though the patient had complained of no special pain. The case may be one of deep-seated suppuration of the breast.

The history of labor often aids in the diagnosis, *e.g.,* a cervical tear reminds one of the likelihood of the early development of a pelvic cellulitis. Conditions which necessitate manipulations about the placental site, *e.g.,* placenta prævia, or adherent placenta, are more apt to be followed by pyæmia. This is also true of infection occurring during labor, intrapartum infection, while the placental sinuses are still open, as in premature rupture of the membranes. Retention of the membranes is a common cause of sapræmia, etc. Pallor, dyspnœa, rapid pulse, 120 or more, a prolonged and severe chill or repeated chills, sleeplessness, jaundice, these are all indicative of severe infection.

Prognosis.—The prognosis depends, of course, upon the variety of infection and, since the most virulent forms are now comparatively rare, the question of a fatal issue is not common, at least in the practice of those who use modern methods. The question has become one of morbidity rather than mortality. It is usually estimated that in maternity hospitals the mortality is less than 1 per cent. In private practice it is probably higher, although exact figures are not attainable. This is by no means necessarily the fault of the practitioner as is too often assumed. In general practice there are often circumstances militating against success which are quite beyond the control of the attendant. Chief among these is the lack of competent assistance. We all know how difficult it is to keep one's hands or gloves immaculate during the whole course of an operation in which the operator must supervise the anæsthesia and attend to various other matters; and how often the vulvar dressings must be left to those who know, or care, little for the rules of asepsis.

In studying the prognosis of this affection, nothing has so forced itself

upon my attention as that the pulse is the best index of prognosis. As a rule, the mere elevation of temperature to 103, or even 104 degrees, without a corresponding rapidity of the pulse, let us say with a pulse of not more than 112 to 116 degrees, does not indicate serious or immediate danger. Such a case is probably one of sapræmia, or if it be a septicæmia it is of the mild type. Of course such a rule is subject to exceptions, but in a fairly large experience it has served me well. On the other hand, a rapid pulse is characteristic of the severe types of infection. If it be 120 or more, and particularly if it remain steadily at this height for from 24 to 36 hours or more, I feel that there is cause for anxiety even though the temperature be not high. Indeed, a comparatively low temperature with a high pulse-rate is a notoriously unfavorable combination. This rule, too, has its exceptions. A congenitally rapid pulse may excite undue anxiety, or its rapidity may be the result of pain, apprehension or nervous anxiety. Now and then it may mean a beginning pelvic peritonitis which happily becomes localized and does not go on to become a general peritonitis.

Here let me note that the localization of the septic process at the side of the uterus, as shown by pain and tenderness in that locality, is in cases apparently severe a favorable symptom, at least so far as any immediate danger to life is concerned. It may mean long disability, but it is nature's method of preventing the free admission of the bacteria to the general peritoneum with consequences rapidly fatal.

Cases of grave infection, general peritonitis, acute sepsis, virulent streptococcic endometritis, are characterized by marked pallor and persistent sleeplessness, both bad symptoms. Dyspnœa is also a bad symptom, whether caused by mechanical obstruction, as in peritonitis, or by the destruction of the red corpuscles, as in profound septicæmia.

Slight chills or rigors are not necessarily of any great significance. A prolonged and severe chill may usher in a general peritonitis or a severe infection. Repeated chills are of bad omen, as indicating renewed infection, especially pyæmic infection.

The presence of hæmolytic streptococci in the lochia is indicative of serious infection, but the organisms are often found in patients who do not seem very ill. The presence of bacteria in large amount in the blood is a fatal prognostic, but in such a case the clinical symptoms are usually too plain to be misunderstood. On the whole the microscope confirms, rather than establishes, a bad prognosis.

Treatment.—The treatment of puerperal infection is preventive and curative. As is so often the case in obstetrics, the preventive treatment is by far the most important. Infection is comparatively easy to prevent, but in its severer forms it is very difficult to cure.

The preventive treatment has been sufficiently discussed in connection with the management of normal labor and it is unnecessary to go over the subject again here. I may be permitted, however, to repeat what I consider the most important points.

1. Gross or macroscopical cleanliness, *i.e.*, prolonged, thorough and repeated washing of the hands with soap and water (running water when it can be obtained) before the use of chemical disinfecting solutions.

2. Use rubber gloves in making examinations, and dip the hands into lysol solution before introducing the fingers, because lysol is a lubricant and lubrication lessens the traumatism and abrading of the maternal tissues. Avoid vaseline and all unguents, whether from jars or collapsible tubes, and whether said to be sterile or not.

3. Strictly limit the number of internal examinations. Learn to observe the progress of labor by external examination, and by observation of the patient.

4. No douches before, during, or after labor, except for hemorrhage.

5. No unnecessary operating and, above all, no unnecessary operating before complete dilatation of the cervix.

6. No examinations or manipulations during the third stage, unless absolutely necessary.

7. Avoid perineal and cervical tears by the methods already described. Repair all perineal tears that involve more than the fourchette.

8. Examine the placenta and membranes carefully in every case.

The treatment of puerperal infection continues to be a matter of controversy. In the days of our fathers it was, like most other disorders, treated by calomel and the lancet. Later it became the field of radical surgical gynæcology, the domain of the curette and the knife. On the whole, it may well be doubted whether this was an improvement upon previous methods.

With accumulating experience and a better understanding of the pathology of the condition it has come to be well understood that much of the former treatment of puerperal infection, surgical as well as medical, was not only unnecessary but injurious.

The present tendency, and one with which I cordially sympathize, is to recognize that the majority of the cases of puerperal infection are self-limited and have a natural tendency to recovery, that surgical operations and intra-uterine manipulations are seldom indicated, as a rule do more harm than good, and are to be undertaken only upon clear and definite indications.

It is evident, too, that in spite of the opposition of the ultra-conservative the serum treatment is gradually gaining recognition as a safe and not infrequently beneficial method of treatment, and that here, as in other varieties of infection not amenable to local treatment, serum or vaccine therapy affords our chief hope of success.

Many writers advise that a careful bimanual examination be made as a preliminary measure, in order to determine the position and condition of the pelvic contents. As a matter of fact, there is no great haste about such an examination. Such an examination, especially if made by a man who prides himself upon being very thorough and radical, may do a great

deal of harm by reopening partly healed tears, tearing open freshly formed adhesions, or even rupturing a pus cavity. It is especially dangerous in cases of gonorrhœal infection. The height of the fundus and progress or arrest of involution, as well as any external tenderness, are determined by cautious palpation, and a finger in the vagina takes note of the condition of the cervix and of any sensitiveness or increased resistance in the *cul de sac*.

Make no unnecessary examinations in cases of infection, and if examination becomes necessary, proceed with all caution and gentleness.

Another piece of advice often given, especially by those whose training has been chiefly surgical or gynæcological and who have seen but little of pure obstetrics, is to proceed at once to a complete disinfection of the birth canal. This advice is based upon two false assumptions, first, that the birth canal can be disinfected by any of the means at our disposal, which, except in certain cases of sapræmia, is far from the truth; and second, that puerperal infection is an entity that can be washed out or scraped out of the uterus, which is also erroneous.

Instead of the above I personally advise that the birth canal, and especially the interior of the uterus, be let severely alone, unless there is some good reason for interference. To this rule I recognize but three exceptions: severe hemorrhage, retention of lochia, and retention of the placenta.

The first two of these emergencies are quite rare and are discussed in their appropriate places. The third, retention of the placenta, hardly ever occurs in the practice of competent men.

If there is a history or a strong suspicion of placental retention, confirmed by a gaping os and foul discharge, the finger should be introduced into the uterine cavity and the placental tissue removed. It is better to be satisfied with the removal of the bulk. Scraping the placental site and the cornua with the curette, as often advised, is not only unnecessary but dangerous. A single intra-uterine douche of hot salt solution, or one-half per cent. lysol, suffices to remove any fragments that remain, to secure good uterine contraction, and perhaps to remove any organisms that have been introduced by the manipulations. It is seldom, if ever, necessary to repeat this douche.

This is accomplished by putting the patient in the lithotomy position at the edge of the bed or table and bringing the cervix to the vulva by pressure upon the fundus. In these cases the cervix is patulous and the introduction of the finger easy. Strict asepsis must be observed. If the patient is sensitive a few whiffs of ether may be necessary.

This procedure is practically never necessary if a competent physician has examined the placenta after delivery and found it entire, and as a matter of fact I now seldom resort to it. To explore the uterine cavity in every case on the theory that a small piece of placenta or membrane might possibly have been left behind is to my mind a dangerous folly and does

far more harm than good. If the uterus is well contracted and the cervix closed it is certain that interference is contra-indicated.

With the single exception noted above I avoid intra-uterine douching. There is no logical reason to suppose that it does any good and there is no doubt that it occasionally does harm.

Especially to be deprecated is the employment of bichloride or carbolic solutions. These solutions do not penetrate animal tissues, as Bumm has shown experimentally. It is, therefore, evident that their action can at best be only superficial. Many cases of sudden death from embolism are on record. The necessary manipulations are highly undesirable, and, most important of all, such injections have been followed by fatal poisoning. Nor is this to be wondered at when one recalls the quantities used, and the extent of raw and bleeding surface exposed. In many cases the first symptom is twitching of the face, and these cases, like those of delayed chloroform poisoning, have not infrequently been mistaken for toxæmia or eclampsia. If some chemical disinfectant must be employed, 50 per cent. alcohol is perhaps the best, and is at all events harmless.

While I have practically discarded intra-uterine douches, I believe that vaginal douching, with proper precautions, is quite harmless, and to a certain extent beneficial. It aids in the removal of decomposing lochia which has a tendency to collect in a stagnant pool in the posterior *cul de sac,* and in my experience is very refreshing and comforting to the patient. They are to be employed, however, only by a trained nurse in whom the physician has entire confidence. She should be instructed to practise the most rigorous asepsis, and to insert the tube well within the vaginal orifice but no farther. To push the tube too high is to risk carrying infective material into the uterus.

The vaginal douche is perhaps a luxury rather than a necessity. Its administration should never be entrusted to an untrained nurse, as is so often done. Its use in hospital wards, where one nurse has charge of several patients, is of doubtful advisability.

If we have no means of surely and safely disinfecting the uterus, we can at least attempt to aid nature in securing good uterine contraction. This is attained by the application of an ice-bag over the symphysis and the administration of ergot. One drachm of the fluidextract may be given at once and followed by twenty minims three or four times a day, thus maintaining a steady and continuous contraction of the uterus. An infected uterus is usually a flabby uterus. The securing of good contraction is the most effectual method of securing the expulsion of all kinds of infected débris that may be present. It also prevents absorption of septic material from the vagina, and by the contraction of the muscles of the uterine wall prevents the transmission of infection through the uterine lymphatics. Most of us have learned to think of ergot as useful only in the prevention and arrest of hemorrhage and have forgotten that it has other and important uses.

The ice-bag also aids in securing uterine contraction and in diminishing pain and soreness when present. Perhaps it has some effect, too, in inhibiting bacterial development. This has been denied by experimenters, but we know that by its use a threatened abscess of the breast can often be aborted.

The curette is mentioned only to be condemned. To my mind it would be just as sensible to curette a diphtheritic throat as a uterus lined with a streptococcic membrane. Multiplied experience confirms this belief. The practice has been given up, or very much modified, by nearly all the teachers and writers who strongly advocated it ten or fifteen years ago. This is of itself convincing testimony. My own experience leads me to believe that in many cases death has been the direct result of the diligent scraping of the uterine interior by some very strong believer in the "surgical method."

We need not then hope to scrape out or wash out the infective process. As Williams pertinently remarks, the organisms have penetrated far into the uterine wall long before the initial chill or the first rise of temperature. Beneath the necrotic layer of endometrium that soon forms are arrayed the leucocytes, nature's barrier against infection. Sometimes the organisms are so virulent that nature's defences are useless, but in general they serve their purpose well, and it is the height of folly to interfere with them.

If the infection has taken the form of a simple catarrhal vaginitis and the uterus is apparently uninvolved, the ice-bag and ergot are still useful, since the best way to keep the infection out of the uterus is to keep the latter well contracted. Vaginal douches are indicated with the same proviso as above.

Something may be done by posture to favor drainage. In actual or threatened peritonitis the head may be elevated, as in the Fowler position. Some advise the Fowler position in all cases, but this is a mistake. There is no reason to suppose that it favors drainage from the uterus. Elevating the head does not diminish, but rather increases, the normal anteversion of the puerperal uterus. Moreover, it increases the work which the heart has to do.

As a rule, it is better to caution the patient against spending too much time in the dorsal position and to advise her to spend more time in the lateral position, turning first upon one side and then upon the other. The lateral position greatly favors drainage from the vagina and uterus. If one gives a vaginal douche when the patient is in the dorsal position, the solution remains in the vagina, but if she turns upon the side it runs out. Here, as elsewhere, water does not readily flow up hill.

Ulcerated surfaces about the perineum and vagina should be cauterized with a 20 per cent. solution of silver nitrate, or with tincture of iodine. In these cases all intra-uterine manipulations, and even vaginal douches, should be most scrupulously avoided, lest infection be carried from a situation where it is comparatively harmless into the uterus where it is highly dangerous.

When the infection has traversed the uterine wall and become localized in the cellular tissue at the side of the uterus, or in the pelvic peritoneum, it is perfectly plain that intra-uterine therapy can do no good, though vaginal douches may still be used. An ice-bag over the affected side serves to alleviate the suffering and perhaps to limit the spread of the infectious process, and a hypodermic of morphine may help to bridge over the most trying period and perhaps, by limiting peristaltic movement, to diminish inflammation. Then, too, severe pain is very depressing and exhausting to a recently delivered woman. This treatment, together with prolonged rest in bed and attention to the bowels, preferably by copious enemata of olive oil, usually serves to abort abscess formation, especially in cellulitis, by far the most common of the localized infections. Even if suppuration is suspected, it is better to postpone the incision until fluctuation is unmistakable. When suppuration appears inevitable, hot applications should be substituted for the ice-bag. It may be necessary to open the abscess above Poupart's ligament, but more commonly it "points" in the *cul de sac* of Douglas and must be opened through the vagina. A word of caution here. It is the most natural thing in the world for the inexperienced operator to make a free incision in the most prominent part of the swelling in the vaginal vault. This has resulted in severe and even fatal hemorrhage from the uterine artery. The incision should begin close to the side of the cervix, even though the latter be pushed far to one side. This incision radiates outward and backward, and should be long enough to admit the finger. The abscess is then sought by the finger or by blunt dissection. When found, it is opened by a pair of blunt-pointed dressing forceps, the blades of which are separated and withdrawn in that position. A gauze drain is inserted. Washing out the cavity is unnecessary and unwise, since there is always the possibility of washing the pus upward where it may do harm.

Pus tubes and abscess of the ovary must usually be operated upon eventually, but the operation should be delayed as long as possible since, as noted by many writers, the streptococci may remain virulent for a long time and the operation for their removal may give rise to a general peritonitis. Fortunately these abscesses are not very common.

The general treatment of puerperal infection does not differ in principle from that of infection in general, and is best considered under four heads, as follows:

1. Specific antidotal treatment.
2. General supporting measures.
3. Symptomatic treatment.
4. Operative treatment.

There is no drug that has shown itself a specific in puerperal infection, but we have in the antistreptococcic serum, first introduced by Marmorek, an antidote which is in certain classes of cases of great value.

In my opinion premature and ill-advised reports have so prejudiced the profession against the serum that much harm has resulted. These reports have been based upon false ideas of what the serum should be expected to accomplish, and of the time and method of its administration. Given in insufficient doses, as a last resort in cases that have perhaps been subjected to curettage and other improper treatment, little can be expected of this or any other treatment.

The serum is not an antitoxin and does not produce the rapid, positive and brilliant results that so often attend the administration of the diphtheria antitoxin. Its action, as has recently been clearly shown, is to stimulate phagocytosis, and thus aid the natural forces in their conflict against the invading bacteria. It has been demonstrated, and upon this point all agree, that it is practically harmless.

From these facts it follows that, in order to secure a fair test of this agent, it should be administered early and often. I do not agree, however, with those who claim that it should not be given late in the disease, since I have seen good results from its liberal use, even under these circumstances.

Bumm, who has made extensive observations with the serum, while admitting that the serum is ineffectual when pus formation has occurred, as in general peritonitis, abscesses in the parametrium and pyæmia, states positively that in cases of streptococcus endometritis, of septicæmia without localization, and of *phlegmasia alba dolens,* brilliant and positive results are often secured by the injection of large doses of the serum—not less than 50 to 100 c.c. He states that the only by-effects that he has noticed are erythematous eruptions, and joint inflammations, which, accompanied by fever, appear from 5 to 8 days after the injection, and spontaneously disappear.

My own results with the serum in severe streptococcic endometritis and in severe sepsis without localization have been very encouraging, and I strongly advise its employment. The objection has frequently been made that many cases of infection are due to the staphylococcus, the colon bacillus, and various other organisms than the streptococcus. This, of course, is true, but while such cases constitute in the aggregate a large number, nevertheless the large majority of infections are of streptococcic origin. Hence, I am accustomed to give the patient the benefit of the doubt if the bacteriological diagnosis is insufficient or unavailable.

It is a very significant fact that some of those who formerly opposed the use of the serum have, after further trial, become converted to its use. Among these is Hirst, who, after giving up the use of the serum, has now resumed its use because, as he says, it cannot be denied that it " is followed occasionally by decided, and sometimes by brilliant, results." Hirst injects 20 to 80 c.c. one to four times a day. Marx, before his lamented death, gave similar testimony.

Of course, a good preparation is essential. I have used for the most

part, and with great satisfaction, that manufactured by the New York City Board of Health.

Up to the present time the results of vaccine therapy seem to have been less encouraging than those obtained with the serum. Williams quotes Sir Almroth Wright as expressing the opinion that nothing will be accomplished in streptococcus infection, although there may be in the case of infection by staphylococcus or gonococcus. This probably expresses the opinion of most authorities at the present time.

Salt Solution.—This apparently does good in puerperal as in other infections. Perhaps the amount of benefit derived is somewhat exaggerated, but at all events the procedure is harmless and it is wise to give the patient the benefit of whatever doubt there may be. The solution may be injected under the skin (a pint two or three times a day), or it may be given in the form of the Murphy drip. The latter is least troublesome for the patient. In bad cases the intravenous method is to be preferred as more direct and certain in its action.

While there is no drug which is a specific for infection, it is a foolish fanaticism to do away with drugs altogether. Aconite, veratrum and other depressing drugs have been discarded, and wisely, and attention is now directed chiefly to the relief of pain and when necessary to stimulation and support. Anodynes are to be used with discretion, of course, but when really indicated should not be withheld.

I do not give alcohol in mild cases, or when the pulse is good, unless the patient is habituated to its use. In that case I usually allow her about what she has been accustomed to have. Its antidotal effect, in certain cases of profound toxæmia and great prostration, is observed in severe streptococcic endometritis and in general sepsis. When, with profound septic intoxication, we find a coated tongue, rapid and feeble pulse, and perhaps *ataxia subsultus* and delirium, the effect is sometimes remarkable. Its effect here seems like that observed in bad cases of typhoid. Its antidotal effect is clearly shown by the fact that patients unaccustomed to its use can take enormous doses without any obvious ill effects. How it acts has been a matter of dispute, but since it has been shown that alcohol is a food up to the point of oxidation, it seems probable that it replaces the waste caused by prolonged high temperature. The dose is to be regulated by the effect, rather than by the measuring glass.

Strychnine in conjunction with alcohol is advised by many writers, and is without doubt useful in bridging over emergencies, but my experience leads me to believe that, when the pulse is rapid and weak, digitalis is on the whole more beneficial. I prefer to use it in the form of Digalen. Digitalis is more than a mere stimulant. By prolonging the cardiac diastole, during which the heart receives its blood supply, it contributes to the nourishment of the heart muscle, and thus aids it most materially. I have no fear of this drug and have often used it with beneficial results.

Operative Treatment.—It is quite natural that the operative treatment

of puerperal infection should have engaged the attention of the profession. Unfortunately the results have not been commensurate with the efforts expended. There is an almost irresistible tendency with men of a certain type of mind to interfere actively in every case of severe infection, and to make the activity of the interference proportionate to the gravity of the disease. All this would, of course, be commendable, if we knew that such interference would do good, or even if we were sure that it would do no harm. This, however, is by no means the case, and one is probably well within the limits of truth in saying that operative interference has, on the whole, done more harm than good.

Moreover, it is well to remember that in any case of severe infection, any operation which involves surgical anæsthesia, some appreciable loss of blood, and perhaps the opening of the peritoneal cavity, if it does no good certainly does harm, and may turn the scale.

Every obstetrician of large experience has seen cases of streptococcic endometritis, of pyæmia, and of general sepsis, without localization, recover from a condition apparently most desperate, and has learned that the mild and moderately severe types of infection have a strong tendency to recover if judiciously let alone.

Of the bad effects of curettage we have already spoken.

All this, of course, does not mean that operative measures are never indicated in the course of puerperal infection; but it does mean that for every operation performed upon a lying-in patient there should be a clear and definite indication.

The most common indication of this kind is to be found in localized collections of pus, *e.g.,* those already described in connection with perimetritis.

CHAPTER XXXIII

AFFECTIONS OF THE BREASTS AND NIPPLES

Leaving aside for the moment infection of the generative tract, which, at all events, in its severe forms is now uncommon in the practice of careful men, it is safe to say that affections of the breasts and nipples and their preventive and curative treatment constitute the most important problem connected with the management of the puerperal state. The results of mismanagement in this direction are far more serious than is commonly supposed, involving a distinct increase in fetal mortality, not to speak of maternal disability and suffering. Like most obstetric complications, affections of the breasts and nipples are more easily prevented than cured. They are far more frequent than they should be and it cannot be too strongly emphasized that the probability of their occurrence and the necessity of taking measures for their prevention should be borne in mind from the beginning. The physician will be supported and aided in his efforts if he can impress upon the parents the undoubted fact that sore nipples, abscess of the breast, etc., involve a definite infant mortality.

Engorgement of the Breasts

This is a simple exaggeration of the distention which occurs normally with the establishment of the milk secretion, on the third or fourth day. The breasts are very tense and hard, and there may be extreme tenderness on pressure, which, however, is general, not localized, as in mastitis, or to a less extent in caked breast. The axillary glands are enormously enlarged and the general discomfort is extreme. In nervous and sensitive patients the reflex effect of all this upon the nervous system is shown in a moderate pulse and temperature rise which disappears promptly with the removal of the cause.

The symptoms are due to circulatory excitement rather than simple distention with milk. The breasts feel warm to the touch, although the thermometer shows no rise in temperature. Large blue veins are seen, with great distinctness, coursing just beneath the skin. In some cases the whole breast and even the axillary region may become œdematous. The condition is often confounded with "caked breast" to be considered directly, but is in reality quite different.

These symptoms, which to the uninitiated are quite alarming, usually disappear without treatment in a day or two, but if very distressing to the patient may be promptly relieved by the simple expedient of emptying the breasts; not because they are due to simple distention with milk, but because they are due to an exaggeration of the physiological hyperæmia plus this distention.

An erosion is a mere abrasion of the surface, often hardly visible to the naked eye but extremely sensitive and capable of causing severe pain to the mother during the act of nursing. It is caused by the traumatism involved in nursing, together with the maceration of the epithelium due to the moisture of the child's mouth, and the flow of milk over the parts, which often continues during the intervals of nursing.

It usually makes its appearance during the first week, and the first symptom is pain in the affected nipple during nursing. Many women complain of sensitiveness from the very beginning, and when this is moderate in amount and is common to both nipples it is usually of no great significance, subsiding in a few days. When, however, the patient complains that one nipple is distinctly more painful than the other, inspection will usually reveal an erosion. Perhaps it is so small as to be hardly noticeable except upon close inspection, when it will be found as a tiny red "strawberry" spot exquisitely tender to pressure. The attendant should make it a rule always to question the patient upon this point, *i.e.*, to ask her whether one nipple is particularly sensitive. I have found that much trouble can be saved in this way.

The nipple should be carefully examined, if necessary with a magnifying glass. The lesion, when found, is always characteristic. The epithelium has been removed and the scarlet papillary surface beneath has a characteristic appearance, which has given it its popular name. This surface is highly sensitive and acute suffering is caused by the child's efforts at nursing, or even by the contact of the clothing, or of any foreign body with the nipple. True, there may be bleeding, but this is by no means always the case. Bleeding is a more constant symptom of fissure than of erosion.

Treatment.—Mere tenderness or sensitiveness of the nipple usually subsides as the nipples become accustomed to the process of nursing, but the process may be materially hastened by the application of a 50 per cent. solution of alcohol, which is not only an astringent, but an antiseptic as well. The child should be put to the breast at regular intervals and always in alternation and should not be allowed to hold the nipples in the mouth when not nursing. The mother should be allowed a sufficient period of rest at night. If tenderness is extreme the case should be treated as one of erosion, whether an erosion can be found or not.

This brings us to the treatment of erosions, always an important matter. The tiniest lesion of the mucous membrane may prove a port of entry for an infection which may result in mastitis with all its disastrous consequences.

Erosions are not likely to heal as long as the causes which produce them are still operative. These causes are the maceration and traumatism involved in the act of nursing.

Both of these causes are best removed by the use of the nipple shield. The combination glass and rubber shield of the kind shown in Fig. 139

is by far the best. The openings in the rubber nipple should not be too small, since suction is a little more difficult than in normal nursing. Sometimes the nipple is so long as to project into the child's throat, thus rendering nursing impossible. This is to be remedied by drawing the nipple backward farther over the neck of the bottle, or by pushing the ivory disk nearer the child's mouth. Again, the nipple may be too large for the child's mouth or the holes in the nipple are too small, and in this case it must be changed. A resourceful and intelligent nurse will almost always succeed. The method involves some trouble at first and an indolent or incompetent nurse will often attribute failure to the child, when the fault is her own.

The only obstacle to this treatment is the occasional opposition of mothers and untrained nurses to the method, due to the fact that some children at first refuse to take the nipple. This can usually be overcome by having the mother lie so that the nipple looks downward and expressing a few drops of milk into the nipple by gentle massage of the breast. Very small, weak or premature children, it is true, may not be able to take the nipple. These should be fed with a medicine dropper or some similar contrivance, the milk meanwhile being obtained from the breasts by massage which is applied at regular intervals.

The whole apparatus should be kept scrupulously clean. After each nursing it should be taken apart, thoroughly cleansed and immersed in a solution of boric acid, there to remain until again used.

Erosions are touched with a drop or two of 8 per cent. silver nitrate solution. The nipple is then well powdered with a mixture of equal parts, by volume, of sterilized bismuth subnitrate and salicylic acid, and covered with sterile gauze arranged in such a way as not to press upon the nipple. Salves and ointments are best avoided. It is difficult to sterilize them and almost impossible to keep them sterile.

Under this treatment erosions rapidly dry up and disappear. The method is practically that which was used at the Sloane Maternity Hospital during the residenceship of Tucker, and is as effectual now as then. The silver solution is applied after each nursing, and the result is the formation of a scab under which healing takes place. The silver solution should be applied directly to the eroded surface under the careful guidance of the eye, and not simply allowed to dissipate itself over the nipple. Repeated applications thicken and strengthen the scab, while the use of the nipple shield prevents its detachment by the efforts of the child in nursing.

Another good method is the application, with a camel's-hair brush, of successive thin layers of the compound tincture of benzoin, and then allowing the child to nurse by means of the shield already described. This method may be practised with a little instruction by any intelligent member of the family. Various astringents and antiseptic powders, tannic acid, aristol, etc., have been advised.

Fissures of the Nipple

A fissure of the nipple is to be regarded as the result of gross neglect. It differs from an erosion in the fact that the lesion is not confined to the mucous membrane, but extends deeply between the papillæ. The nipple seems to have cracked open and perhaps bleeds freely. There is no possibility of mistake in diagnosis.

Treatment.—Here, again, the best application is silver nitrate. It is best applied in the form of lunar caustic. The "stick" is whittled down to a sharp point and applied carefully and thoroughly to the entire surface of the fissure, the balance of the nipple being covered meanwhile with sterile gauze. This serves to limit the application to the fissure proper and prevent its diffusion over the moist surface of the entire nipple, thus turning the nipple black, a disfigurement which is not pleasing to the patient.

Fissures of the Base

Now and then, fortunately not very often, the fissure is at the base of the nipple, *i.e.*, at its junction with the areola. The nipple looks as though it were being separated from the breast. These fissures are most intractable of all, since every movement of suction tends to reopen the wound. In bad cases it may be necessary to stop nursing. Even these cases, however, may usually be cured by the methods above described, if begun early. Before giving up the attempt it may be wise to try the experiment of removing the child from the breast for a few days, feeding it in the meantime with milk expressed at regular intervals by massage.

Puerperal Mastitis or Abscess of the Breast

One of the greatest misfortunes that can befall the puerperal woman is the development of inflammation of the breast proper. While seldom fatal it not only prevents nursing, but, if at all extensive, destroys the functional activity of the breast and thus prevents nursing in future pregnancies. In this way it undoubtedly tends to increase infant mortality. Moreover, it is a painful and exhausting process, necessitating one or more operative procedures and leaving more or less mutilation, too often a permanent reminder of carelessness or defective technic. The subject is one which deserves more attention than it usually receives (Fig. 418).

Etiology.—Mastitis is due to infection through lesions of the nipple. The reader should grasp this fact at the outset and never let it go. Its recognition is of the greatest possible importance from the stand-point of prevention. It is true that certain writers maintain that bacteria may pass directly into the milk ducts of a sound and uninjured nipple, and thus give rise to a parenchymatous mastitis, and that a breast abscess may be part of a general pyæmia, but such cases, while of course theoretically possible, are so rare as to be of no practical importance. Personally, I have never seen a case of abscess occurring during the lying-in period in which I could not detect or elicit a history of erosion or fissure of the nipple.

Irregularity in nursing, inspissation of milk, and engorgement of the breasts are usually regarded as predisposing causes. I do not think their influence is very great.

Classification.—Leaving aside the small, superficial abscesses or "boils" which are occasionally found just beneath the skin, usually near the areola, and which are of no great clinical importance, inflammation of

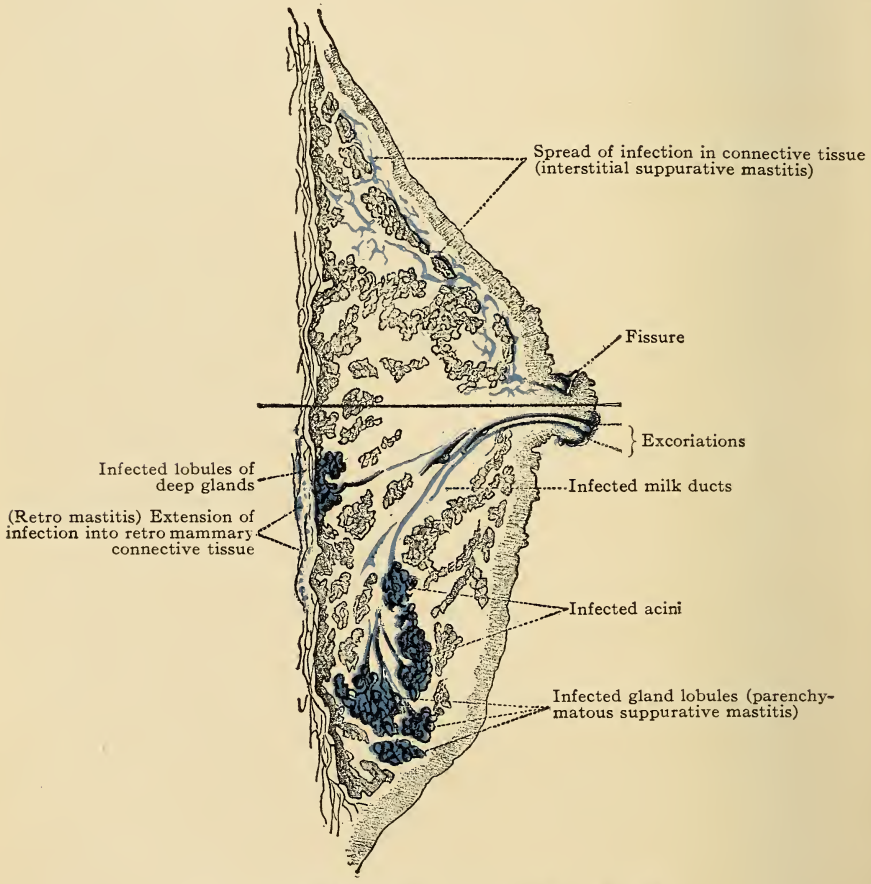
Spread of infection in connective tissue (interstitial suppurative mastitis)
Fissure
Excoriations
Infected lobules of deep glands
Infected milk ducts
(Retro mastitis) Extension of infection into retro mammary connective tissue
Infected acini
Infected gland lobules (parenchymatous suppurative mastitis)

FIG. 418.—Extension of infectious processes in the breast.

the breast is divided into two principal classes, parenchymatous and interstitial (phlegmonous). In the first, the offending organism is usually staphylococcus albus, and the infection is transmitted through the milk ducts. In the second, the organism is the streptococcus, and infection is transmitted by means of the lymphatics.

Clinical History.—In the parenchymatous form, which is more common, the first symptoms are a rise of temperature and an increase in the

pulse-rate. Fever and rapid pulse are noted before the local symptoms are marked; indeed, in some cases while they are still hardly noticeable. In these cases the local symptoms are often entirely overlooked until the process has gone too far for any hope of arrest. The area of tenderness is not always well-marked at first, and perhaps the indurated area is deeply located and not easily made out. The area of induration and tenderness is at first ill-defined, and can be located only by deep pressure, and the cause of the fever may be for a day or two undiscovered. Hence the rule: "In every case of fever occurring during the lying-in period examine the breasts." The process may take rise in any part of the breast, but as a rule it is the lower and outer part, *i.e.*, the most dependent part, that is affected.

The Submammary Form.—In this form, fortunately rare, there is an extension of the infectious process, a parenchymatous mastitis, to the submammary space instead of to the surface of the gland. The general symptoms are threatening, but the local symptoms not well-marked. Late symptoms are œdema and swelling at the periphery of the breast. At this time the breast appears to be lifted above the chest wall and on palpation feels as though it were floating upon something beneath. If no relief is afforded the condition may go on to one of grave general sepsis with all its symptoms and dangers.

Interstitial or Phlegmonous Mastitis.—In this form the symptoms are more acute. Swelling and tenderness appear at an early period and progress is rapid. The surface of the breast soon takes on an erysipelatous appearance. Measures designed to abort the process have less effect.

Diagnosis.—It is usually taken for granted that the diagnosis of mastitis can present no difficulty—that its existence or non-existence must be self-evident. And yet mistakes are often made, though most of them, it is true, are due to carelessness. The chief cause of this is the latency of the symptoms already mentioned. This is often marked in the parenchymatous, but most of all in the submucous forms. In the latter variety even the careful and experienced examiner may be obliged to reserve his decision. Every obstetric consultant occasionally sees a case in which an unexpected mastitis has been treated as one of pelvic infection.

It is most important to distinguish between "caked breast" and true mastitis, especially the parenchymatous form. In either case there is a mass in the breast which is moderately tender, and even in caked breast there may be more or less fever from one cause or another. Rigors, and especially distinct chill, of course, indicate infection. A temperature of 101 to 102, lasting for forty-eight hours, usually means infection. Most significant of all is a pulse of 120, continuing for from thirty-six to forty-eight hours. And yet I have noted occasional exceptions to these rules, especially in the case of neurotic individuals.

Rigors, and, above all, a well-marked chill, point to mastitis. In the

case of a doubtful swelling the aspirating needle may solve the difficulty. The coexistence of an erosion or fissure of the nipple of the same breast makes the diagnosis almost positive.

All doubtful cases should be treated as cases of mastitis. If a mistake has been made such treatment, pursued for a day or two, can do no harm, while to treat a beginning mastitis by hot applications and massage is to favor its rapid dissemination throughout the gland.

Treatment.—Most important of all is prophylaxis. This has already been considered, and it remains only to repeat and emphasize what has been said. Every case should be approached with this fact in mind. Erosions of the nipple can and should be quickly cured, fissures should be prevented and regularity and cleanliness in nursing strictly enjoined. Physicians and students should be constantly reminded of their duty in this matter. I have often noticed that many, who are commendably careful as to the technic of vaginal examinations and obstetric operations, are strangely ignorant or indifferent with reference to the prophylaxis of breast infection. This fact should, I think, be emphasized by teachers of obstetrics.

As regards preparation during pregnancy, I do not believe that for the normal nipple anything more is necessary than cleanliness and the avoidance of injurious pressure. When we see that those who attempt to harden the nipples with alcohol claim results as good as those who attempt to soften them with oils and ointments, we may well believe that nature is better at this kind of preparation than art. If the patient insists upon something, a 50 per cent. alcohol solution, which is a good antiseptic, is, perhaps, as good as anything.

Suppose that symptoms of mastitis are present but not very marked. Shall the child be removed from the breast? Most authorities advise that this be done on the ground that by stopping nursing we diminish the functional activity of the gland. It has always seemed to me that this somewhat theoretical objection is more than counterbalanced by the fact that the cessation of nursing causes engorgement of the breasts and inspissation of milk. This was also the conclusion of Tucker after an enormous experience at the Sloane Maternity Hospital. If evidences of suppuration are positive, the child is, of course, at once removed from the breast.

The application of cold is very valuable. An ice-bag should be applied over the tender area and kept there constantly. This not only aids in aborting the process, but materially diminishes the suffering of the patient. The best local application is ichthyol ointment 50 per cent., or even pure ichthyol, which should be covered with oiled silk or rubber tissue in order that it may be absorbed by the underlying tissues and not by the dressings. Over the ichthyol and the rubber tissue may be placed the ice-bag. All unnecessary handling of the parts should be scrupulously avoided. The suction apparatus of Bier for the production of local hyperæmia has been tried, but the results have not been encouraging, and it seems plain that

treatment of this kind, if it does not do good in incipient mastitis, can only do harm. Rather free purgation by salines helps materially. Above all things, do not make a mistaken diagnosis of "caked breast" and use massage and hot stupes.

This simple treatment, begun early and carried out rigidly, will abort many cases. But what of those which cannot be aborted, or which are seen too late?

As soon as fluctuation can be detected, the abscess should be opened by an incision radiating from the nipple, as shown in Fig. 419. The manner of making this incision is important. It should be carried down through the skin and subcutaneous fat, but only as far as the breast proper. To continue the incision with the knife is to risk cutting the ducts and causing a milk fistula which may be long in healing. A pair of artery clamps or some blunt instrument is now pushed into the abscess cavity and the opening bluntly enlarged, until it freely admits the finger, which explores the cavity, and, if necessary, converts two or three pockets into one. The cavity is then lightly packed and one or more counter-openings made if necessary. It is better to make these counter-openings through the post-mammary space than through the breast itself, thus avoiding further destruction of the gland tissue.

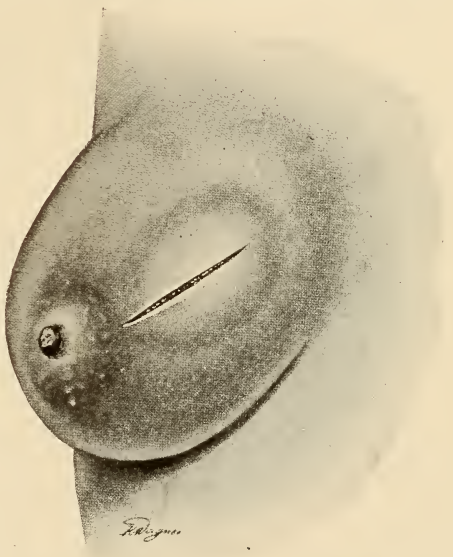

FIG. 419.—Treatment of mammary abscess. Good direction of incision.

The cavity should not be too tightly packed, nor should the packing be continued too long. There are some cases in which the cavity does not close because its closure is made impossible by the treatment adopted.

A suction apparatus for removing the collected pus when the wound is dressed is very useful. The use of such an instrument does away with the temptation to squeeze the breast and thus spread infection throughout the gland.

In the submammary form the incision is made at that point in the breast which appears to be most dependent as the patient lies upon her back. The use of the aspirating needle may be necessary.

In making an incision in the breast, the operator should be careful to keep entirely outside the pigmented area. If he does not observe this precaution, the pigment follows the line of incision and may involve a large portion of the breast, causing disfigurement not at all pleasing to patient.

Deficient Secretion of Milk (Agalactia)

This is quite common. In many cases the cause defies discovery. Strong and healthy women may be unable to nurse their children, while anæmic and seemingly delicate women may have an abundance of good milk. Now and then the cause of the patient's inability to nurse may be found in the presence of some exhausting disease, *e.g.,* tuberculosis, carcinoma, etc., or in the acute anæmia following a severe hemorrhage. Sometimes the cause may be a local condition, *e.g.,* the destruction of the parenchyma of the breast by a mastitis following a former labor. Late primiparity is an undoubted factor, and there is such a condition as hereditary glandular deficiency.

Treatment.—In the first place the attendant should not admit too early that the supply is deficient. I have waited until the fifth or sixth day. In some families the theory that the mother will not be able to nurse her child is only too eagerly accepted.

When the supply is really deficient there is unfortunately not a great deal that can be done to replenish it. Various articles of diet and semi-proprietary remedies have more or less repute among physicians and laity alike. Among these are milk in large quantities, fish, especially shellfish, oatmeal and cornmeal gruel, and the various malt preparations.

There is a widely diffused, popular idea that alcohol in one form or another, *e.g.,* ale, beer and porter, promotes the secretion of milk. I do not think that this is usually true, except, perhaps, in the case of those who have become habituated to its use. If the patient has been in the habit of taking a little wine or beer with her meals, this is at all events not the best time for her to discontinue the custom.

The use of pituitrin has been attended by no great success, and the same thing may be said of other drugs or agents which have been thought to have a specific action. General medical treatment, however, is important. Of the good effect of such treatment, the use of iron in anæmia affords the best example. Arsenic combined with iron, or used when the latter proves ineffectual, is sometimes of value. The attendant, if in doubt, will do well to look carefully into the general health of his patient. For example, it would be unfortunate at this time to overlook a general tuberculosis.

Local treatment by electricity, massage and the Bier apparatus has not been productive of marked results.

Physiology has not as yet told us why milk is secreted at a certain time, nor why the supply is sometimes deficient. Hence it should not seem strange that as yet we have no specific. On the whole, I believe that the best results will be obtained by a varied and liberal diet, expert care of the general health, and an out-of-door life, with an abundant supply of fresh air at all times.

Finally, the mother should never be allowed to continue nursing the child simply as a matter of sentiment. After it has once become plain

that the milk does not afford sufficient nourishment, some other form of feeding should be promptly instituted. In some cases a dangerous form of inanition develops with startling rapidity.

How to "Dry Up" the Milk

If by reason of the death of the child, or for some other cause, the cessation of nursing becomes necessary, even though there is an abundant supply of milk, there may be considerable inconvenience, or even pain, for a few days. The symptoms are much the same as those of engorgement of the breasts already described. A special régime was formerly supposed to be necessary in this class of cases. The breasts were very tightly bandaged, iodide of potash and other drugs administered, and belladonna or some other ointment applied. For many years I have regarded all this as unnecessary, and have allowed the breasts to take care of themselves, with uniformly good results, and with far less discomfort to the patient. Now and then a dose of codeine may be necessary in the case of an extremely nervous and sensitive patient, but even this is not often required. A saline cathartic may be given if there is much distention. The old-fashioned tight breast bandage, which was a veritable torture, is entirely unnecessary. The whole process was a typical instance of meddlesome midwifery. So far as I know, Whitridge Williams was the first to subject this method to a systematic clinical test, and Storrs, who in 1909 reported a list of cases treated in Williams's Clinic, had observed no case of mastitis among them.

Milk Fistula

Now and then a milk duct is involved in the destructive process attending a breast abscess. More often, perhaps, it is severed by the knife of an operator who has not learned the technic of the operation for the relief of this condition. The resulting fistula remains open, discharging milk for months, to the great embarrassment of the incautious operator. If simple compression of the breast fails to effect a cure, the treatment becomes wholly surgical. The injection of some irritant may be tried, or it may even become necessary to lay open and curette the fistulous tract, allowing it to heal from the bottom.

Galactorrhœa

This term is applied to a continuous flow of milk, a flow which does not cease during the intervals between nursings and which may continue indefinitely even after the child has been removed from the breast. It may continue for years. In some cases the general health is affected, in others not. The cause is unknown and the treatment largely experimental.

Here the tight bandage may be of some use in producing compression of the ducts and engorgement is to be favored rather than otherwise. It has been thought that the condition is associated with uterine atrophy,

and that it sometimes disappears with the return of the menses. Hence uterine stimulation by hot douches and the use of electricity has been practised with apparent benefit. Iodide of potash, chloral, ergot and belladonna have been used with varying success.

Galactocele

By this term is meant the retention of milk in a pseudocystic cavity formed by the occlusion of a milk duct. The tumors are usually small, but exceptionally may reach enormous proportions, as in the well-known case in which the tumor contained ten pounds of fluid and reached to the groin. In doubtful cases the diagnosis is established by exploratory puncture.

Supernumerary Breasts

This curious phenomenon is of no special clinical importance, except when an accessory breast happens to be located in the axilla. In this case, owing to the proximity of large nerve trunks, the tumor may be quite painful. The unpleasant symptoms are usually of short duration. Garrigues recommends the application of *unguentum iodi.*

Hypertrophy of the Breasts

As in puberty, so in pregnancy, there is a physiological hypertrophy of the breasts, which sometimes attains such proportions as to be distinctly pathological. The hypertrophy is general, affecting all parts of the breast. Cases have been recorded in which a single breast weighed as much as fifty pounds. One or both breasts may be involved. The weight and the general health may be much affected, and the skin covering the breasts is so stretched as to break down, resulting in ulcerated surfaces.

The treatment of this affection constitutes a surgical problem that need not be discussed here. It should be recalled, however, that the condition does not necessarily contra-indicate nursing, and, like fibroid tumors of the uterus, has a tendency to disappear during involution.

If the patient's general health bids fair to be seriously affected, it may become necessary to consider the induction of abortion or of premature labor.

CHAPTER XXXIV

OTHER COMPLICATIONS OF THE PUERPERIUM

It would be quite impracticable for us to consider here all the affections and accidents which have been known to complicate the puerperal state. Such an encyclopædic task would carry us far beyond the limits of a practical work, and perhaps only serve to distract the attention from subjects of urgent and immediate importance. There are, however, certain conditions that are directly connected with the puerperium, or are of importance from the stand-point of diagnosis, and which should not be neglected. Of these perhaps the most characteristic and the most important is subinvolution.

Subinvolution

We have already studied the processes by which uterine involution is brought about, and the phenomena which accompany the restoration of the uterus corresponding approximately to that which obtained before the beginning of pregnancy. Whenever involution is arrested, or seriously retarded, the resulting condition is known as subinvolution.

The term subinvolution is used in a rather general way, and perhaps not infrequently serves to cover lack of knowledge or errors in diagnosis. Without doubt, the most common cause is infection of one kind or another. Indeed, the most constant symptom, at once a symptom and a result of puerperal infection, is subinvolution.

Whether we believe that involution is due to fatty degeneration or to autolysis, we know that its immediate cause is a local anæmia, a cutting off of the blood supply to the uterine muscle, and that this local anæmia is due to the retraction and contraction that normally follow delivery. It follows, therefore, that whatever interferes with this contraction necessarily favors subinvolution. And so we find it in practice. Examples are to be found in the various kinds of endometritis, mostly septic in origin, in cervical lacerations, retention of the placenta, uterine displacements, constipation, too early resumption of household duties, etc. It is plain that most of the factors act, not so much by mechanically preventing uterine contractions, as by bringing about a venous stasis in the uterine circulation. In many cases both factors are present. For example, a fibroid may mechanically prevent uterine contraction and the coexisting endometritis may keep up a congestion of the uterine mucous membrane.

Strangely enough, the general health of the patient does not seem to have much to do with the progress of involution. This is strikingly illustrated by the fact that even in bad cases of puerperal pyæmia, without uterine localization, the uterus is not seriously affected. Just as in actual

labor anæmic and feeble patients often have good uterine contractions, so the processes of involution appear to go on without much reference to the general condition of the patient. Contrary, however, to the general opinion there are certain cases in which constitutional conditions do interfere with involution. An example is to be found in certain forms of cardiac disease attended with interference with the return circulation. Subinvolution is more frequent after long and difficult labors and severe operative deliveries, and a moderate degree is often present after the delivery of twins. It is a well-known fact that involution progresses more slowly when the mother does not nurse her child.

Reviewing the above we may conclude that certain local causes, and, much more rarely, certain constitutional causes, *acting locally*, tend to prevent the physiological anæmia of the uterus and thus retard the process of involution.

Diagnosis.—As a rule the diagnosis presents little difficulty. He who is accustomed to watch the daily descent of the fundus, as advised in the chapter on the management of the puerperium, will not fail to note deviations from the normal. For example, the fundus is easily palpable above the symphysis pubis at the end of two weeks, at which time it should be no longer available to external palpation. The uterine enlargement is confirmed by internal examination, and the body of the uterus has a soft boggy feel, not unlike that of early pregnancy. The lochial discharge is prolonged and is followed by a persistent leucorrhœa. The patient complains of backache and " bearing down " sensations. Displacements often coexist, whether as the cause or the result of the subinvolution it is not always easy to say. Of these postpartum displacements we have already spoken.

If the menstrual flow is absent, as is usually the case during lactation, the question of a possible pregnancy may have to be deferred until a second examination a few weeks later.

Treatment.—Rest in bed should be enjoined, the patient, however, being advised to change her position frequently. Ergot may be given in small but frequently repeated doses, 15 or 20 minims of the fluidextract every four hours. This may usefully be combined in equal parts with the fluidextract of hydrastis. After the third week hot vaginal douches may be of assistance. The bowels should be kept open by some mild cathartic and attention paid to the general condition.

Displacements should be corrected. Placental tissue or membranes should be removed by the finger or, with great care, by the forceps. The use of the curette is dangerous at this time and should be avoided.

Superinvolution (Lactation Atrophy of the Uterus)

This curious phenomenon occurs only in nursing women. The process of involution does not cease at its normal limit, but continues until the uterus becomes atrophied, sometimes in a high degree. In a case reported

by A. R. Simpson the uterine cavity is said to have measured but one-quarter of an inch in length.

Little is known as to the cause of the condition. There seems, however, no doubt that it is in some way connected with lactation, since it usually disappears after the child has been weaned. Williams considers that the cessation of menstruation which usually accompanies lactation is due to some process analogous to superinvolution. Hirst has seen uterine atrophy follow a curettage three times repeated.

Displacements of the Puerperal Uterus

After delivery the dilatable part of the uterus, *i.e.,* the cervix and lower uterine segment, is thin, overstretched and flabby, while the corpus uteri, which requires, approximately, from four to six weeks to return to its normal proportions, is still many times the size and weight of the non-pregnant organ. Under these circumstances, bordering as they do upon the pathological, it is not strange that malpositions should result. Now and then the normal anteflexion of the pregnant uterus becomes so exaggerated that an acute angle is formed between the upper and lower segments, preventing the escape of the lochial secretion. If no relief is afforded, very acute symptoms may supervene. The distention of the uterus by the retained secretion causes great discomfort and nervous excitement, and to this is soon added more or less sapræmia from decomposition of the retained lochia. The uterus has a "boggy," semicystic feel. The lochial secretion appears to be absent. With all this there may be a temperature of 102 or 103, and a pulse correspondingly, or even more than correspondingly, rapid.

The above represents an aggravated form of the condition. In most cases the accumulated lochia escape before the symptoms become very marked.

The treatment is simple and effective. If the finger is passed through the internal os and traction made in a downward and forward direction, the canal is straightened and there is a gush of ill-smelling lochia, which is followed by prompt relief and disappearance of the symptoms. It is sometimes advised that a tube be left in the uterus for drainage, but this is objectionable from the stand-point of asepsis. It is usually sufficient to keep the patient in the dorsal position for a day or two, meanwhile securing uterine contraction by means of an ice-bag to the fundus and a few doses of ergot.

Other Displacements

Of the other displacements which may complicate the puerperium I have already spoken in connection with the management of that period, believing that any scheme of management which omits a search for these complications, and attempts to remedy them if found, is of necessity defective. Such a search and such an endeavor should not be relegated

to cases obviously abnormal, but should be part of the routine management of every case. It is only in this way that the physician will secure freedom from criticism, and, what is more important, that he will fittingly discharge his responsibility to those entrusted to his care.

Intercurrent Affections

Of these something has already been said, and this need not be repeated here. Those only concern us especially which present problems in diagnosis. Prominent among these are scarlet and malarial fevers.

Scarlet fever deserves special mention. Formerly supposed to be common during the puerperium, it is now known to be very uncommon. Its supposed frequency was in reality an index of the frequency of septic rashes. The septic rash may be identical with that of scarlet fever, even to the point of desquamation, a fact not generally known. Nowadays these rashes are not as common as formerly. I have discussed the diagnosis elsewhere, but it is worth while to repeat here that in view of the responsibility involved the decision should not be made in haste. The other exanthemata present no special features for consideration.

Malaria.—The diagnosis of malarial fever at this time should be regarded with reserve, but there is no doubt whatever that latent malaria has a tendency to become active during the puerperium. There are two conditions which simulate malarial infection very closely, *viz.,* puerperal pyelitis and puerperal pyæmia. It is not necessary to go over the clinical history of these conditions again, but the reader will remember that in both there may be well-marked chills followed by high fever and profuse sweating, and with intervals apparently normal. Without blood examination the diagnosis may be for a time uncertain.

Diphtheria.—It is not worth while to consider all the specific infectious diseases which might possibly complicate the puerperium. These diseases when finding their port of entry in wounds of the genital tract have nothing to do with the puerperium *per se,* but are simply rare forms of puerperal infection. For example, true diphtheria may occur at this time, but is very rare. Infection of puerperal wounds by the Klebs-Löffler bacillus, as determined by microscopic examination, is not true diphtheria as the term is ordinarily used, though it calls of course for treatment by the diphtheria antitoxin. It may be well to remark in passing that the grayish pseudodiphtheritic patches found upon the vulva and vagina in certain cases of infection have nothing to do with true diphtheria.

Tetanus.—Puerperal tetanus is rare in this country, but is said to be quite common in India. Garrigues, a pioneer in this field, had collected fifty-seven cases in 1882; the number has been more than doubled since that time. The disease usually makes its appearance soon after delivery and its symptoms and course are the same as those of tetanus arising from the infection of other than puerperal wounds. In view of the gravity of the prognosis it is always worth while to try the antitetanic serum.

Pneumonia.—True pneumonia seldom originates during the puerperium, but is seen occasionally after a premature labor brought on by the disease. The chief interest here centres in the problem of diagnosis. In most cases of death, said to be due to pneumonia, the pneumonia is of septic origin or perhaps a terminal process.

Cough.—This, it is true, is only a symptom, but if violent or spasmodic should be suppressed, since it predisposes to hemorrhage, and to that very serious, if rare, accident, the detachment of an embolus.

Typhoid.—In the cases of supposed typhoid, occasionally seen at this time, the diagnosis is difficult, since in severe infection the patient often passes into the so-called typhoid condition. If the result of the Widal test is negative, the case is probably one of infection.

Diseases of the Urinary System

Gonorrhœa, cystitis and pyelitis have been considered in connection with the pathology of pregnancy. I need only reaffirm here my belief that cystitis in the puerperium is, for the most part, a preventable disease caused by the unnecessary use of the catheter. The preventive treatment is most important and is given in the chapter on the management of the puerperium.

The Puerperal Psychoses

When we consider the wonderful changes wrought by pregnancy in the physical constitution of woman, we need not wonder that her sensitive and impressionable nervous system is profoundly affected, and this in cases approximately normal. Often enough we recognize the change, although we cannot describe it. Looking into the eyes of the woman who realizes for the first time that she is to become a mother, we see something that sharpens thought and stimulates attention. She seems, not only to herself but to others, to be moving in a world that is new; and so, indeed, she is. And as mental states, even in the non-pregnant, elude definition and defy classification, so do they become more puzzling and elusive in pregnancy. In pregnancy our patients often occupy the borderland between physical health and disease, and at this time the borderland between sanity and insanity, always ill defined, is much wider than at other times.

Thus it happens that mental disturbance during pregnancy usually takes forms that do not lend themselves well to classification. They are rather exaggerations or perversions of mental peculiarities or tendencies from which no one is free. An exaggerated melancholy, a condition of profound depression, is the most common, and is most likely to occur during the early months. It is probably due to the anæmia and malnutrition so common at this time. Stuporous and confusional states are less common and more likely to occur at a later period of pregnancy. Toxæmia probably plays some part in their etiology. Maniacal conditions are hardly

ever seen. Most of the insanities of pregnancy, unless of hereditary origin, disappear shortly after delivery.

According to the teachings of modern psychiatry there is no special type which is peculiar to pregnancy or the puerperium, nor is either of these, properly speaking, a cause of mental disease. Either, however, may be the occasion of the lighting up of some smoldering neuropathic tendency.

According to Kräpelin, some sort of morbid psychosis may be noted in 7 per cent. of puerperal cases, the number originating during pregnancy being somewhat less. As a matter of fact, if we exclude the minor disturbances which, although coming within the bounds of some scheme of classification, are nevertheless usually passed over as mere "moods" or eccentricities, and at the same time consider the long duration of pregnancy as compared with the few weeks comprising the puerperal period, we will find that mental disturbance is very much more frequent during the puerperium than during the months preceding delivery.

Why is this the case? The question appears to be answered by the fact that the psychoses most frequently seen at this time are the *infective-exhaustive* psychoses. It is hardly necessary to tell anyone that infection and exhaustion are characteristic features of the abnormal puerperium. Of what produces infection we need not speak again. The most prominent type of infective psychosis is that of *febrile delirium*. The duration and severity of this constitutes in some degree a measure of the mental stability of the patient. The delirium is usually brief, follows the febrile movement, and differs little except in degree from ordinary fever delirium. It is important to remember that the fever of infection is not often, at least in its early stages, accompanied by delirium.

Next in order come two well-defined psychoses which may either follow the form just mentioned, or develop independently as the result of exhaustion. These are *collapse delirium* and *acute confusional insanity*.

Collapse delirium may follow difficult labor, unusual loss of blood, or severe mental shock. It is characterized by an acute onset, a condition of confusion which may be mild in character, constituting only a marked perplexity or, in other cases, attended by psychomotor restlessness, with profound clouding of consciousness, complete disorientation, dreamy illusions, hallucinations, and delusions. The course is rapid, usually only one or two weeks, and recovery is the rule. Defective heredity is said to be present in one-half the cases. The above description will be recognized at once by all those who have worked in the maternity hospitals of a great city. According to my experience it is far less frequent in private practice. A similar condition sometimes follows eclampsia. Here we might speak perhaps of a toxic-exhaustive psychosis.

Acute confusional insanity develops a little later as the result of exhaustion plus the anæmia of lactation, and lasts for some months. The prognosis is favorable.

A large proportion of the mental disturbances that complicate the puer-

peral period, nearly one-half are of the stuporous type and come under the classification of *dementia præcox* and its allied types. Most of these cases run a favorable course. Those, however, that develop before labor or during lactation offer a doubtful prognosis.

Finally, there is another type of puerperal psychosis, *manic-depressive insanity*. This includes what were formerly known as puerperal mania and puerperal melancholia, and were supposed to have some specific connection with pregnancy and the puerperium. They are now regarded as links in the chain of manic-depressive insanity, a psychosis which has a tendency to return, in some form, at different periods in the life of an individual. Defective heredity has been found in from 70 to 80 per cent. of all cases. Many cases referred to by the older writers as mania are in reality cases of delirium.

The above classification, which is that of Brink, seems to me to afford a good groundwork for the study of a fascinating, if not very practical, subject which, of course, cannot be taken up here, and concerning which few obstetricians can speak with authority. If I may venture a word of advice, however, I would urge the reader not to forget the two types, febrile, and collapse delirium. Occurring, as they do, shortly after delivery, they are certain to come under his observation sooner or later, and since they are seldom properly described may be the source of mistakes in diagnosis and of errors in treatment.

For the diagnosis and treatment of the other forms the reader is referred to works on psychiatry, and is advised to consult a psychiatrist whenever this is possible. A few general suggestions, however, may be of service. In the first place the attendant should see that his patient does not have the opportunity to injure herself or her child. No regrets or excuses will atone for the neglect of this precaution. Hypnotics may be necessary, but should be used with discretion. For example, it would not be wise to give cardiac depressants in a case of exhaustive delirium. The modern hydropathic treatment of these conditions should be studied. Sometimes the prolonged warm bath (immersion bath) is of marked benefit, and, again, the cold pack, if not contra-indicated, is to be preferred. If the patient is alarmed at the idea of the bath, she may first be quieted by suitable medication.

Postpartum Paralysis in Mother and Child

I have referred elsewhere to the neuralgic pains or "cramps" that are so often observed during labor and that are caused by the pressure of the child's head upon nerves that pass over the brim of the pelvis. It is easy to imagine how exaggerated or long-continued pressure of this kind may result in lesions sufficient to account for the neuralgic pains that sometimes long outlast the puerperium, and even for the paralysis that sometimes follows it. The affection is usually unilateral, corresponding to the side toward which the occiput is directed. The present tendency is to attribute the

condition rather to the pressure of the head in delayed labor than to the employment of the forceps. Contracted pelvis has been cited as a cause. Unusual size of the head would be a parallel instance. It is said to result less frequently in the case of a flat pelvis because the projecting promontory prevents the head from descending far enough to be subjected to serious pressure. My own observation leads me to believe that it is usually the result of the premature or unskilful use of the forceps.

It is the region supplied by the external popliteal nerve that is most affected. This nerve receives fibres from the fourth and fifth lumbar cords before it unites with the sacral plexus, and is most exposed to pressure in its passage over the brim of the pelvis. The result of pressure on this nerve is paralysis of the anterior and outer muscles of the leg, that is of the flexors of the foot and of the extensors of the toes, so that the foot is flexed upon itself (plantar flexion) and turned inward. Even though the injury has not been sufficient to cause paralysis, there may be pain and numbness along the distribution of the affected nerves.

Hæmiplegia is, of course, a possible occurrence during the puerperium as at other times. Factors that favor its occasional occurrence at this time are eclampsia and venous thrombosis.

Neuritis has many times been noted during the puerperium. The best description in English is that of Garrigues. He recognizes two types, the localized or mild type, and the general or severe type. The localized form may affect either the arm or the leg, more commonly the former. Even this, as I have witnessed it, hardly deserves the term mild, except perhaps as compared with the generalized form. There are the usual symptoms of an aggravated neuritis, *e.g.,* severe pain, tenderness along the course of the affected nerves, numbness, loss of power in the innervated muscles, etc. In bad cases the arm or leg may become swollen or œdematous. The nerves usually involved are the median and ulnar nerves, and the sciatic. The attack may be prolonged and the suffering severe, but recovery is the rule.

In the generalized form many nerves may be involved at one time, even those of the eyes and of respiration and deglutition. The prognosis is grave.

Until we know more of the metabolism of pregnancy we shall be in doubt as to the cause of puerperal neuritis. It is now usually put down as toxæmia, and some color is lent to this theory by the fact that it has been observed in cases which have been subject to the vomiting of pregnancy. Local causes undoubtedly play some part, since the condition is not infrequently associated with a pelvic exudate or a femoral phlebitis.

Other causes of pain in the lower extremities, and difficulty in walking, which should be borne in mind, are injury or even rupture of the symphysis, or one of the sacro-iliac joints, during difficult labor, and, most common of all in my experience, varices of the leg or thigh, sometimes rather deeply seated, and often unnoticed or disregarded by the patient.

Duchenne's Paralysis

We have already become familiar with the transient facial paralysis of the new-born, which so often develops after forceps operations in which much traction has been made, and which soon becomes familiar to every practitioner.

With the exception of this form, Duchenne's paralysis is the most common and typical met with in the new-born. The affected area involves the distribution of the fifth and sixth motor roots of the brachial plexus, and affects chiefly the flexors and internal rotators of the arm. In a typical case the arm hangs at the side with the hand turned inward. This form of paralysis is usually attributed to compression or stretching of the nerves in the delivery of the after-coming head, especially when the Prague method is used, or, in vertex cases, to traction by the finger in the axilla, or even to direct compression with the forceps.

Prevention.—This is a highly important matter. The Prague method of delivering the after-coming head should be banished from the text-books. In the Mauriceau method pressure should always be made upon the after-coming head whenever there is any difficulty in delivery. The head is to be pushed, not pulled, through the pelvic canal. The final movement is one, not of traction, but of extension.

I do not think there is much danger of compressing the brachial plexus by the forceps tips. Indeed, this is hardly possible if the head is of normal size and well flexed. It might happen, however, as Stolper has shown in cases of marked extension, *e.g.*, in presentations of the face and brow. The correct method of applying the instrument in face presentations is shown in Fig. 362. In difficult delivery of the shoulders lateral flexion of the neck should not be too pronounced.

Delayed Chloroform Poisoning

As we have seen in connection with the subject of postpartum hemorrhage, chloroform, while hardly ever the direct cause of death during labor, strongly predisposes to uterine relaxation after delivery. Then, too, it can hardly be doubted that its effect as a cardiac depressant, when added to the shock of an operative delivery, may hasten a fatal issue. To these charges against this once favorite anæsthetic has recently been added another, that of "secondary" chloroform poisoning.

The symptoms of this condition make their appearance two or three days after delivery and consist of apathy, with mental and physical depression which may deepen into coma and death. Moderate evening fever may be present, and jaundice occurring early is highly significant.

Williams reports a case which terminated fatally, the autopsy showing lesions in the liver similar to those produced experimentally and to those which are found after death in eclampsia. The patient was under the influence of chloroform, which she took badly, for over an hour.

I have myself seen one case which I regarded as one of chloroform poisoning, although of a milder type. This patient, who also took the anæsthetic badly, consumed a good deal of chloroform during a difficult forceps operation, which, however, was less than an hour in duration. Two or three days after delivery she showed evidences of mental and physical apathy which, however, never deepened into unconsciousness. There was a slight evening rise of temperature, 101–102, and distinct, though not very marked, jaundice. The patient recovered.

Puerperal Myalgia

Observation has led me to believe that the puerperal patient is peculiarly subject to attacks of acute myositis, or, as it is popularly called, muscular rheumatism. At all events I have seen such attacks so often that I believe it worth while to call attention to them. The phenomena are essentially those of "stiff neck," lumbago, etc., and vary according to location. The cause is most often to be found in the exposure of some part of the body to a prolonged current of air. Predisposing causes are the relaxation of the muscles and the free perspiration so characteristic of this period.

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